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EDITORIAL NOTES.

Gas Legislation Miscellany.

IN the editorial columns of the last two issues of the "JOURNAL" in September, comment was made upon the more prominent features of the gas legislative work of the past session; but, in reviewing the Gas Acts in four articles (the final one of which appears to-day), a few additional points invite reference. A particularly striking feature is the extent to which protective clauses for county councils and railway companies now run; and we cannot help thinking that great economy would result if something could now be done to settle the conditions of all these clauses, and to assemble them in, say, a General Act, so that they could by reference be incorporated in part or in whole. The conditions in some cases are loosely framed, and inequitable, and so will be an open way to a perfect flood of dispute, to the ultimate advantage probably of our legal friends, but to the expense and worry of those controlling gas undertakings. The length of the protecting clauses in some Acts is preposterous. Take two examples. In the Riddings Gas Act, there are no less than fourteen pages occupied by protective clauses out of the forty-six pages constituting the Act. In the Ellesmere Port Act, there are over six pages occupied in the same manner. Something surely could be done to arrest this sort of thing, and so assist promoters to save money, and to know precisely how far they need go. The county councils' demands are in several cases extravagant, and vary as between council and council; and a great deal of worry is occasioned and time expended in negotiation to try to effect an agreement over the demands, which grow with time. Often negotiation is abortive; and the expense of obtaining Acts is run up largely in a contest before Committees in the effort of the councils to obtain something over and beyond their Common Law rights.

But the indefinite and inconclusive character of some clauses is especially striking. In certain cases (it seems to be almost a stereotyped clause put forward by some county councils), it is provided that all mains or pipes laid, after the passing of the Act, in any main road or over a main road bridge shall, where reasonably practicable, be laid in such a position in the road, or at the side thereof, and at such depth as the county council may, in writing, under the hand of their surveyor, reasonably direct. There is a beautiful indefiniteness and one-sidedness about this. What a county surveyor may regard as reasonable in respect of position and depth may be very unreasonable from the point of view of the gas suppliers. But the latter will have to put up with it, however irrational and obstinate the surveyor, unless they take advantage of the arbitration provision. Such a course would run them into considerable expense, just as might compliance with unreasonable requirement, and this expense many small companies would not care to face or risk on the chance of securing some abatement in the conditions. The county councils, under such circumstances, hold the small companies tight in their powerful grip. Then in one or two Acts, we see exemption is granted from liability for injury occasioned by steam-rollers of 15 tons weight. But as a model of superlative inconclusiveness and liberty is a provision, among the Cheshire County Council clauses in the Ellesmere Port and Whitby District Council Act. This exempts the County Council from liability for injury caused to any main or pipe, by reason of the depth at which it is laid below the surface of the road being "insufficient for "protection from injury," in consequence of the proper exercise of the powers and duties of the County Council; and the use by them of "a steam-roller for the repair of any "such road, bridge, or approach shall not be deemed to be "an unreasonable exercise of such powers or duties." For one-sidedness, this clause could hardly be surpassed by the most expert of draftsmen, backed by the most tyrannical of county councils. Under it, if a gas-main or pipe suffers injury in any way through operations by the Council, they would have the right to argue that injury having occurred was proof that the depth of the pipe (whatever the depth) was insufficient for its protection. And as to the steam-roller, the Council under the clause, whatever the character of the road or subsoil, might go to any weight they like, and then, in the event of injury to a pipe, they would say: "The "use of a steam-roller must not, under your Act, be 'deemed "'to be an unreasonable exercise' of our powers and duties, "and moreover the fact that there has been injury shows that "the pipe was laid at an 'insufficient depth.'" In some cases, it will also be seen that various depths for mains are prescribed, that differentiation in depth is made between cast-iron and steel mains, and that charges are fixed for restoring the surfaces of roads after pipe work. To none of these conditions can there be the slightest objection, providing that reason prevails. One good feature about some of the clauses where the county council undertake road restoration work after pipe-laying is that provision is made for the indemnity of the gas suppliers against liability to damage occasioned by the delay of the county council in executing the work. If such a provision had applied to the Commercial Gas Company, they would have fared better than they did in certain recent litigation.

Another matter that has been borne upon us in reviewing the Acts is that there is now little use in gas undertakings annexing outside districts if they have no serious intention of extending their service to the areas within a measurable distance of time. Several companies have had protected possession of an area limited to three and five years, and, in the case of the Chelmsford Company to ten years, after which periods other would-be gas traders may step in, and (without opposition from the present holders of the privilege of supply) may have conferred upon them the necessary rights, and have extinguished the existing powers. In the Edenbridge Gas Act, we see that the Company may not only have, after three years, their powers (if unexercised) annulled in respect of the new limits of snpply, but, in regard to certain specified roads, the additional capital is to be reduced by £660 for every mile of 6-inch main unlaid, and by £440 for every mile of 4-inch main unlaid. This is an unusual, but it may prove to be a salutary, provision.

Companies coming for incorporation and full statutory powers for the first time will observe that the insertion of purchase clauses is again rather frequent. This is a pity, as it is certain to act as a deterrent to applications to Parliament by many of the non-statutory companies, who, as a rule, do not wish to be despoiled of their enterprise. It will also be remarked that the past session has seen a movement from the long-established prescription of 8-10ths as the minimum pressure—to 12-10ths in the cases of the Edenbridge and Kidsgrove Gas Companies, to 15-10ths in the case of the Skegness Company, and to 20-10ths in the case of the Isle of Thanet Gas Company. Kidsgrove and Walsall obtained a standard illuminating power of 13 candles, tested by the "Metropolitan" No. 2 burner; and Walsall may consume gas at the rate of 6 cubic feet an hour to realize the prescribed power. The adoption of the calorific standard has, of course, been the feature of the session; but we should like to see the parliamentary authorities come to some determination on the matter of the conditions for forfeitures, and not have the deficiencies expressed in some cases in total numbers and in others in percentages. It will be seen that in the cases of the Bedwas and Machen and the Porthcawl Acts, cause was shown why the penalty line should be placed at 475 B.Th.U., and not at 7½ per cent. below the standard of 540 B.Th.U. In connection with the general purposes clause, Parliamentary Agents should see to it that in their clients' Bills this conforms with the decision of the Joint Committee on Gas Residual Products, and not follow the model clause drafted for the past session, which does not carry out the recommendation of the Joint Committee. Comment was made upon this matter in the "JOURNAL" for Sept. 29, in the article headed "A Scrap of Paper." The

clause in the Chelmsford Gas Act of this past session gives all that is required: "May purchase, convert, manufacture, "and sell all residual products resulting from the manufac- "ture of gas." Or if it is preferred to be more explicit, after "purchase" the words "for purposes of manufacture" might be inserted as in the Edenbridge Act. The Skegness Gas Act contains another verbal variation: "May purchase, "manufacture, convert, supply, and sell all residual pro- "ducts," &c. Several local authorities have taken power this session to attach brackets and wires to houses and other buildings in their jurisdictive areas, so as to provide for central street lighting.

Disuniform Periods for Loan Repayments.

One other point. There do not appear to be any settled conditions respecting periods of repayment by local authorities for different purposes. When local authorities are purchasing established gas-works, the state of the works, and whether they are to be continued or discontinued, are factors in deciding the length of repayment periods, and so variation would, of course, be occasioned in this connection. In the case of the Middlesbrough Corporation, they are purchasing the North Ormesby Gas Company's works, and are allowed thirty years as the repayment period. Probably they will discontinue these works. Certain it is that the Ashington District Council will discontinue the dwarfed gas-works of the local colliery company. For the money so spent, a repayment period of thirty years has also been granted. In precisely similar circumstances are the Ellesmere Port and Whitby District Council, in purchasing the gas-works of the Shropshire Railways and Canal Company, which works have to be removed. The Council in this case have to repay the money so spent in 25 years—five years less. The Cleckheaton District Council are given 35 years in which to repay the loan required for the purchase of the gas-mains of the Bradford Corporation in the District Council area; and a similar period is granted to the Porthcawl District Council for the loan needed in taking over the local gas-works. But why should the Bedwas and Machen District Council be allowed a period of twenty years for the repayment of loans for services, meters, stoves, and fittings, while the Ellesmere Port District Council are only given ten years? Then it is seen that the Ellesmere Port Council have bestowed upon them a period of forty years for the repayment of the money spent on the erection of new works; while the Porthcawl District Council are to liquidate the loan raised for gas-works extensions (which are equally new works) in twenty-five years. The disuniformity is interesting as showing that, although legislation is supposed to co-ordinate rights and privileges, and to produce justice where there is an inequality in conditions, Parliament has not in connection with local authority gas-works yet reached the stage when periods of loan repayment are consistently allotted according to the subject for which the money is borrowed.

Private Electric Plants on Gas-Works—And Elsewhere.

Although outside the walls of most gas-works there are the cables of the town authority or company supplying electrical energy, the engineers of those works prefer to instal their own private generating plant to do work in the retort-house that was previously performed by compressed air, hydraulic power, or the rope-drive, and, in some instances, for supplanting steam, owing to the ready and economical transmission of electricity from point to point about the works. Experience confirms the wisdom of the choice of the private plant rather than having reliance on the town source of power, which is erratic, and has a propensity to failure at the time of heaviest stress. Moreover, the private electricity plant is merely a means for converting the work of a gas-engine into a convenient form of energy. This employment of electricity by gas-works is naturally made use of by our electrical friends in the cultivation of their power business, and in the work of attempting to displace gas and steam engines. But the peculiar requirements of gas-works in regard to power are diplomatically kept in the background in making known the fact of their use of electrical energy. These peculiar requirements are referred to in an article on other pages; and if fair play had free run, they would be mentioned by the competitors of gas power. But the electrical man would not regard himself as a good commercial tactician if he did not secure full advantage from the fact of the use without qualifying it by a statement of the circumstances. One thing, among others, the gas industry can do is to turn the tables on the electricity trader by using its experience with private gas-driven generating plants to develop the installation of private plants among industrial users of power, cinema proprietors, and large shopkeepers. There are many instances of the profitable employment of such plants in the country.

Until one comes to collect material for an article such as the one in other columns, the extent of electrical operation in gas-works processes is only regarded in an abstract or indefinite sort of way as large. But here we have gathered, without any particular effort, information as to 120 to 130 gas undertakings that are using electrical current in the British Isles, and probably there are others. Large as the use is, the number mentioned is less than a tithe of the total number of gas-works in the country, though the works included in the figure cover a considerable percentage of the gas output of the country. But the available information placed in juxtaposition to the information possessed as to the number of works not using electrical energy exhibits the extent of this special field for electric application and operation; and it also shows that there is a big custom in the gas industry for the electrical plant industry. Most of these private generating plants are in duplicate; and the motors required are several for the various parts of the plant, as is seen by the statements as to typical installations. But with all this work, there are few instances of the absolute displacement in gas-works of horse power obtained by means of gas-engines. The purpose for which the gas-engines are used is the only thing that has changed. They have been centralized; and the energy developed by them is distributed and applied indirectly instead of directly.

Using gas for the prime movers, and incurring little cost and having small losses in distribution, the electrical energy is obtained at moderate expense; but there does not appear to have been in British gas-works much done in the way of keeping records of the actual consumption of electrical energy for various operations in relation to the work performed. The cost of the whole of the work done in many, if not most, cases is lumped together; and so there are no means of knowing whether the greatest possible efficiency is being obtained from all parts of the plant. A sleepy satisfaction over costs *cum* convenience takes the place of the little additional trouble involved by measurement and recording results. This is a great pity. Mentioning the point recently to Mr. Charles Hunt, he told us that, when visiting the new gas-works at Amsterdam, he was struck by the fact that indicators are employed there for registering the expenditure in units of electricity for every operation. This must be of invaluable advantage in keeping a hold over efficiency. In the article elsewhere will be noticed some results from a test, under working conditions, with a projector plant driven by electricity; and the extraordinarily low load factors recorded for the individual operations will be observed.

This metamorphosis in the power methods of gas-works is a matter of considerable interest; and there is not the slightest reason why more should not now be heard of it as a matter of technical concern to gas engineers. With the extension of this new phase in gas-works equipment, there will be still greater competition among the makers of electrical plant for the supply of gas-works direct or through the gas-plant makers who incorporate electrical plant in their contracts. And still more so if gas undertakings will enter seriously into competition with electricity suppliers for the custom of large establishments using electricity, as some gas companies are doing to-day, with profit to themselves and to those who have sufficient demand to justify a private generating plant. Instances are the popular cinema theatres that have sprung up in every town, and most of which are doing good business, which promises to be permanent. In many towns, however, gas undertakings have been asleep over the strong position they occupy in regard to the cheap provision of the energy required in such theatres; but the convincing article on the subject (by Mr. H. C. Widlake, of Plymouth) which appeared in our columns during August—describing the requirements of the "picture palaces," and the methods of meeting them, as well as supplying concrete evidence of the financial value of private electricity generating plant to both cinema owner and gas undertaking—should do much to arouse interest and perseverance in securing as much as possible of this new business.

Mr. Widlake dealt with the uneconomy of the largely

adopted existing methods in conjunction with the external cables, and with the cheapness of the cost of units, and the economy in the number of units used, from the private plant; and he does not speak without very good authority. How a private generating plant could effect economy in the number of units used had not occurred to us before reading the article. But when one considers that the standard pressure required in the operating-boxes of the cinema theatre is 70 volts, and that, drawing current from the town cables, motor-generating sets are usually employed to realize the necessary voltage, with an efficiency for the set of only some 68 per cent. (*i.e.*, the output of the dynamo is only 68 per cent. of the current actually taken by the motor), it will be seen that there is a loss of some 30 per cent. There is also considerable waste where, as an alternative, a bank of resistances in series with the arc is employed. Moreover, there are "tricks" in the electrical trade, as well as in some others. There is no need for the ordinary lighting of the buildings to be supplied from circuits connected after the dynamo feeding the projector; the circuits could well be connected up before the motor generator set. But what would then be the result? The electricity suppliers would lose the supply of the 30 per cent. waste incurred in the conversion by the motor-generating set to the lower voltage of all the current consumed by the lamps. Not all electricity suppliers indulge this practice; some do.

Altogether, we have had an enlightening, practical, and useful article from Mr. Widlake; and he crowns the case for the private gas-driven generating set by giving the experience for some months at a Plymouth cinema, at which, with a duplicate generating plant (each set being of a capacity best suited for the purpose to which it is put—an important point in economy), the generating costs, including every charge, have amounted to only 1·18d. per unit for all purposes, with an independence from any of the vagaries of external supply.

Elaborate Gas-Supply Regulations.

In this country, gas and electricity suppliers harbour the belief that they have good cause of complaint over statutory regulations that impede their movements, and render their commercial life somewhat irksome, in comparison with traders in other lines of business. Those who look upon their regulations contemptuously apply to them the descriptive term "grandmotherly legislation." If to them it is a consolation to know that the term has stronger applicability elsewhere, they may find it in this issue of the "Journal." The Illinois Public Utilities Commission have lately been devoting themselves to formulating a set of general and special service rules for gas supply. These have been prepared under the direction of the Chief Engineer to the Commission, by Mr. S. P. Farwell, Chief of the Service Department, and Mr. A. S. B. Little, Gas Engineer. The last-named gentleman has in his time played many parts in the gas industry; but it has been mostly in connection with gas constructional work and manufacturing processes. Therefore it was not within our knowledge that his experience had qualified him to take part in legislative work governing the relationships between suppliers and consumers, and the apparatus through which there is trading between the one and the other. However, by their joint efforts, these gentlemen have produced a most elaborate set of rules, which throughout show that they kept before them, in strong limelight, the gas consumers' interests, and away back in the dim shadows the interests of the gas suppliers. Cast-iron regulation will render immobile even public service utilities; and where such a condition obtains, these utilities cannot serve the consumers so well as where there is more reasonable freedom. Were we directly interested in the gas supply of the State of Illinois, we should prefer to see the regulations less stringent, and less one-sided. Suppliers of gas are not as a rule thieves or rogues. The success of their business depends very largely upon giving every satisfaction to their customers; and if they do this, it is better than working to a strict formula, compliance with which, they are apt to think, is sufficiently comprehensive of all their obligations. The greatest advances in this country in rendering good gas service to the community have been in directions in which there is little or no regulation. To see the proof of this, one has only to look at the nature of the work done on the supply district to-day for the benefit of both gas consumer and gas business.

We do not in any way suggest that every regulation found in the elaborate set before us are unnecessary or are not good. There is belief in full records being kept by every gas undertaking. Such records are good in helping to maintain a high standard of efficiency in working. But it is clear that, under these rules, gas undertakings of even moderate proportions are to expend money upon, maintain, and have ever ready in good working order, an equipment of testing apparatus that would make stand on end the hairs of the heads of some gas managers in this country who know comparatively little of laboratory and testing apparatus. There would be a good many in this country who would apply for "specific excuse" from the Commission for not being bothered by such an appalling provision of testing equipment as appears to be necessary to carry out all the requirements of these new rules. The equipment proposed is not only for the testing of the gas for calorific value and purity, but for meter testing. Each six months, every consumer may question the accuracy of his meter, and may demand to have it tested, and that without charge, although the meter may be absolutely right. This is not equity. The consumer may be an irascible person; he may be one of those who are the victims of whims and fancies; he may be one of those who think that every person with whom they do business is a thief or a rogue; he may be one of those who believe the gas-meter is the only piece of mechanical apparatus that suffers from inefficiency and inaccuracy—no matter, provided his meter has not been tested within six months, he may, by simply writing a letter, compel the suppliers to test it. In this way, every consumer may have his meter tested twice a year, if so disposed. The regulation foreshadows expense and trouble—at least it would do so this side of the Atlantic, and we do not imagine that human nature is much different on the other side. The gas suppliers ought to at least be protected by the right to charge their consumers for all tests where the meter is found to be correct. When it comes to the Commission making a test—a "referee test" it is called—upon the written application of the consumer, substantial fees are charged. The Commission look with genuine care after their own interests. Should it happen that the meter is more than 2 per cent. fast, the fee is repaid to the consumer by the gas suppliers. Another piece of one-sidedness is that, when meters are found to be fast, the suppliers are to refund to the consumer a percentage of the amount of his bills for six months. Where, however, a meter does not register or is found to run slow, while an account may be rendered for six months not covered by previous bills, the suppliers are only to take this action in cases of "substantial importance" where the suppliers are not at fault for allowing the incorrect meter to be kept in service!

Probably the system in Illinois is different from that obtaining in this country in connection with the rendering of gas accounts. Here the meter inspector enters on a card (which is left with the consumer) the state of the meter index from quarter to quarter. From this, comparisons and checks can be made by the consumer. But the Commission have decreed that consumers' bills shall be complicated by all kinds of information being entered upon them. They are to show the readings of meters at the beginning and at the end of the period for which the bill is rendered, the number and kinds of the units of service supplied, the dates of the meter readings, and the price per unit of service. What on earth good can some of this information be to the consumer on every bill rendered! If the provision applied to the electrical concerns in this country, then worse follows: "On all bills which are com-
"puted on any other basis than a definite charge per unit
"of service, the other factors used in computing the bill
"shall be clearly stated, so that the amount may be readily
"computed from the information appearing upon the bill."
Just fancy all the factors used in computing charges on the maximum demand system, or the Norwich system, or on some of the Marylebone tariffs, being clearly stated on each electricity bill! We should imagine the Commission set out to make ordinary commercial trading just as irksome as possible. A clause—the one marked "*d*"—under "Gas-
"Meter Accuracy" suggests that prepayment consumers are not to be charged a higher amount than consumers who purchase gas on the ordinary system of supply. Perhaps, however, there are in this respect conditions that make a difference between the positions in the State of Illinois and this country.

All the provisions are not bad. A compulsory installation test for a meter is good; and so is the periodical testing of gas-meters, save that five years is far too short a period

for large gas undertakings. It means that 20 per cent. of the whole of the meters in use must be tested each year. This is far too onerous; and a much longer period should be allowed. This was a point dealt with when editorially discussing, in the early part of this year, the then proposed legislation for high-pressure meter testing [see "JOURNAL," Feb. 3 last, p. 273]. It is not right—it is bad policy—for meters to be left (say) for thirty years, running year in year out, without being tested. No meter deserves such reliance being placed on it as that; and the neglect of the periodical testing of meters in some undertakings must, we opine, be responsible for a considerable part of the heavy amount of unaccounted-for gas which disfigures the annual or half-yearly statements.

No particular criticism can be made of the calorific value provisions. In America a higher illuminating power gas has been the practice; and therefore a standard of 565 B.Th.U. (total heat value), on the average of a month's testings, and with the stipulation attaching that the calorific value is never to be below 530 B.Th.U., is not—considering the pre-existing conditions—at all a serious matter, although it should be borne in mind that the height of the calorific standard is not everything to the consumer. But in view of the fact of the stability of the calorific value of a gas, we cannot see why a gas undertaking should be exposed to the roving testing condition implied by the words that the gas shall have, "at any point at least a mile from the place, " and tested in the place where it is consumed," the monthly average total heating value prescribed. A testing-place at the works (where the gas suppliers can have a representative present at any official test) controlling the entire output would be sufficient. The regulations also recognize the value of a higher minimum pressure than was the practice at one time of day; and it is now prescribed that the minimum shall not be less than 2 inches, and not more than 8 inches. Our own Legislature has also recognized that the long-established 8-10ths minimum is to-day effete, and altered it in various Acts last session. In the Margate Company's Act, 2 inches was the minimum pressure prescribed. But in these Illinois regulations, the 2 inches refer to the outlet of a consumer's meter; and this makes the stipulation more onerous. Under any circumstances, 2 inches minimum pressure will mean for any existing undertaking an overhauling of the distribution system at over-loaded points and at extremities. It is an unnecessarily stiff stipulation, especially in large residential areas. There is something rather stupid in the clause referring to interruptions of supply. No one carrying on a gas or electricity service would be so unmindful of his obligations, in the event of an interruption of supply, as to neglect using every endeavour to re-establish it promptly, without prescription by the controlling powers.

Judging from British conditions, it seems to us that sound legislation, practical requirement, and equity have gone somewhat astray in the prescriptions that are now before us. If the work of preparation had been entrusted to a number of conscientious gas managers, engaged in the daily work of gas supply, the result would undoubtedly have been of a far different order, and one upon which there could have been compliment instead of adverse criticism.

Hygienic Gas-Fires.

The fact that the makers of gas-fires appear to be tumbling over each other now to have their fires certified as passing the new standard of hygienic efficiency, speaks of the growth of the demand for such fires. It is appreciated by the buyers that gas-fires which will pass a test showing total immunity from escaping products under the canopy without the aid of flue-pipe or chimney must be the most dependable of all. Since the "Lancet" laboratory staff offered to test, by their carbon tetrachloride method, fires received from makers, they seem to have been almost inundated with samples of the modern productions. The results of the tests of the fires of various firms have already appeared in our columns; and to-day tests of fires submitted by Messrs. Fletcher, Russell, and Co. and the Planet Foundry Company, show that they, too, have passed the critical examination with a perfectly clean sheet.

The Evening Gloom and Public Safety.

Since our article on this subject appeared a week ago, the gloomy condition of the streets of London after dusk has (if anything) deepened, by the further curtailment here and there of street lighting, aided by the fact that those recalcitrant shopkeepers who thought they could ignore the orders to diminish the illumination of their shops have been brought to their senses by the police authorities. The foolish Chiswick beerhouse keeper, who was fined £5 and costs for obstructing two police officers when they bade him reduce the lights in his place of business, has supplied an illustration of the compulsory nature of the orders. These have not been made for mere fun. But some people—this Chiswick beerhouse keeper, for instance—thought they could, or rather that they would on their private property, exercise their discretion in the matter. They have discovered their mistake, and have learned that private interests cannot be permitted to operate in such times as the present against collective safety. There are few people who are aware that this lowering of the lights of London and elsewhere is being carried out under one of the emergency measures passed by the Legislature which empower His Majesty to make provision for the defence of the realm in war time, and under which those guilty of disobedience to regulations may be tried by Court-martial. However, no unselfish persons have objected to the strange order of things which now obtains, and people have quickly managed to remodel their actions and arrangements to suit it. By regulation we are being made more and more a stay-at-home people. Even some of the theatres are now giving afternoon performances instead of evening ones; and the police, satisfied with the good results of shortening the hours for the sale of intoxicating liquors to eleven p.m., have from yesterday made a further restriction to ten o'clock. Those who have been accustomed to stay out late over the final glass will thus be enabled to know the value to them of an extra hour or two in bed. There is one thing that must be insisted upon; and it is that drivers of mechanically propelled road vehicles shall be compelled to moderate their speed from that permissible when the streets were brilliantly lighted to one compatible with the darkened roadways. At the same time pedestrians must remember that just as the streets are dark to them, so they are to the driver of a motor car or an omnibus.

Do We Have Too Much Light?

But what of the gas and electrical light suppliers? All this lowering of street lighting and the shortening of the open hours of places where intoxicants are sold and of ordinary shops, are having a bad effect on the output of the two principal lighting agents. But the suppliers will all philosophically face a condition of things which cannot be helped, consoling themselves with the knowledge that what is being done is in the country's interests. The experience is forcing another question to the front. The "Daily Telegraph" has referred to it. It has remarked in a leading article: "We suspect that a good many people in their hearts prefer the subdued illumination to the harsh and somewhat garish glitter of the streets as they were in the past before the war. That streets should be adequately lit is as essential as that they should be well and perfectly drained. But is it necessary that so fierce a light should beat about the entrances to the Tube stations, that the fronts of cheap jewellers and the porticoes of the picture houses should be dazzling, or that every circus should be ringed with the popping lamps which perpetually spell out the same unsought but hardly disinterested advice? . . . The thought must have occurred that there has been a stupendous waste of electric light." Of electric light, yes, but not of any other light. The number of street gas-lamps in London is far in excess of electric lamps. The gas-lamps are efficiently lighting roads, in compliance with modern traffic requirements, as is requisite. It would, of course, never do to go back to the primitive conditions that prevailed in the days of the lumbering horse-drawn omnibus and the old "four-wheeler." But it is something gained to have a paper of the standing of the "Daily Telegraph" recognizing that the harsh and garish glitter of some of the lighting of the streets and in front of picture palaces and Tube stations is a condition which we can well do without for both public and economical reasons. The improvement of the streets would be further effected by the suppression of the monotonous electric advertisement signs.

Further Aid for Traders.

The energy displayed by the Commercial Intelligence Branch of the Board of Trade in their campaign on behalf of the British trader, in connection with "enemy" markets that may be captured, is really remarkable. From time to time there have been noticed in the pages of the "JOURNAL" such of the reports

on German and Austrian exports as more closely concern our readers; and this number is added to in the present issue. As a matter of fact, the report on "Heavy Chemicals"—a document containing much interesting information, which includes tar and tar products—is No. 67 of the series; and others have been subsequently published. The desire to afford to persons who can make good use of it detailed particulars regarding trade openings, has already been emphasized here; but to the latest issued reports a further note has been added, which it is important that employers should bear in mind. It is to the effect that the Board of Trade National System of Labour Exchanges have on their books at the present time particulars with regard to large numbers of skilled and unskilled workpeople who are seeking employment, and that employers desiring workpeople should notify their vacancies to the nearest Labour Exchange. The exchanges, it is added, will give particular attention to requests from employers for special classes of workpeople for new trades, and for workpeople (men or women) to replace temporarily those who have taken naval or military service. But the activity of the Commercial Intelligence Branch does not end here. Having received a great number of inquiries for names of buyers or sellers of articles business in which has been interfered with by the war, they have made special arrangements for dealing with them. The inquiries are listed, and a copy of this list brought as nearly as possible up to date may be had on application. Firms connected with any particular lines of business mentioned in the list are invited to communicate with the Director of the Department, at No. 73, Basinghall Street, London, E.C.; and they may rest assured that what assistance may be possible will be rendered to them.

Gas in the Home.

There is a great deal to be said on the subject of the most recent developments in home gas lighting, and at any rate a large proportion of it was said last Friday evening by Mr. Walter T. Dunn, in the course of a "lecturette" which he delivered at an informal meeting of the Junior Institution of Engineers. A practical discourse of this character would be useful under any circumstances, but more particularly is this the case on an occasion like that selected for its delivery. The membership of the Institution named, of course, is drawn from those engaged in many different industries; and although (as notices of the proceedings which appear from time to time in the "JOURNAL" show) gas duly occupies its place among the subjects considered at the meetings, an audience composed solely of gas experts could not be expected. Those who did not know before what a high position of excellence has been attained by gas as a lighting medium in the modern home (through the use of improved fittings, &c.), must have gone away considerably wiser after listening to Mr. Dunn's plain exposition of the facts; while even those present who had made it their business to study these matters spent a really enjoyable evening. Everything possible had been done to make the meeting a success, and a success it certainly was. The notice of the lecture which appears elsewhere in this issue, without showing the numerous exhibits and the number of lantern slides which were displayed, hardly conveys a fair idea of the excellence of Mr. Dunn's effort, or of the trouble he had taken in getting together the materials for the lecture and demonstration. It was, to sum the matter up, a good lecture on a good subject. The meeting, as already stated, was one of those "informal" ones which are a feature of this Association's work—and a feature which commends itself very much. For discussing a matter so nearly touching domestic life as the lighting of the home, the feeling of comfort engendered by the smoking of pipes and the drinking of coffee (as is done at these informal meetings) appears to be particularly appropriate.

Benevolent Fund of the Institution of Gas Engineers.

A special general meeting of contributors to the benevolent fund of the Institution of Gas Engineers will be held at the Institution offices, No. 39, Victoria Street, S.W., next Monday afternoon, at 2 o'clock, when a proposal will be submitted (moved by the Chairman, Mr. John Bond), on behalf of the Committee of Management, to appoint Mr. Charles Carpenter, D.Sc., Trustee of the fund, to fill the vacancy caused by the death of Mr. Thomas Newbigging, D.Sc. In the notice calling the meeting, the Hon. Secretary (Mr. Walter T. Dunn) says that as there are likely to be exceptional calls made upon the fund owing to the war, the Committee would feel very grateful if contributors would endeavour to obtain new subscribers among their friends. Amounts of 5s. and upwards will be cordially welcomed. At the present time there are not sufficient funds to meet all the cases requiring help.

PERSONAL.

At a meeting of the Turriff Gas Company held last week, Mr. LYALL, a solicitor, was unanimously appointed Manager and Secretary.

Mr. WALTER T. DUNN, the Secretary of the Institution of Gas Engineers, has been nominated for election as a Member of Council of the Chartered Institute of Secretaries.

Mr. A. M. TAYLOR, of the Distribution Department of the Swansea Gaslight Company, has been appointed to the post of Chief Inspector to the Wellington (New Zealand) Gas Company, applications for which position were advertised for in a recent issue of the "JOURNAL." Before leaving Swansea, Mr. Taylor was the recipient of two presentations—a gold-mounted fountain pen, suitably inscribed, from the Distribution Department workmen, and an inscribed travelling clock from the general staff. Mr. R. G. Clarry made the presentation on behalf of the staff, and testified to the good work done and the ability shown by Mr. Taylor during his brief stay of six months at Swansea. The presentation, he added, showed how well Mr. Taylor had worked with the staff—a fact which was confirmed by brief speeches from Mr. F. Andrews (the Assistant Manager), Mr. C. Standish (Rental Superintendent), Mr. C. Ablett (Works Assistant), and Mr. W. Cattell (Chief Salesman). Mr. Taylor received his training under Mr. Henry Hawkins (late Engineer and Manager of the Todmorden Corporation Gas Department, and now of Limerick); and subsequently held appointments at Hereford, Airdrie, and Stretford. He is to marry to-day Miss W. Laycock, of Rochdale, and will sail for New Zealand on Friday.

DEATH OF MR. ADAM COOKE.

WE regret to record the death last Tuesday, at his residence at Langley, after a long illness, of Mr. Adam Cooke, the Engineer and General Manager of the gas undertaking of the Oldbury Urban District Council.

Mr. Cooke was born at Congleton, and was for several years Manager of the gas-works there. He left the town about 1881 to take a position in connection with the new gas undertaking at Oldbury. This place was originally supplied with gas by Birmingham; but in 1876 the Local Board of Health obtained parliamentary power to erect gas-works of their own, and these were opened on Dec. 31, 1881. The first Manager was Mr. F. J. North, who in 1885 left England to go to Brazil, and was succeeded by the late Mr. Charles Meiklejohn, who held the position till he went to Rugby in 1892, when Mr. Cooke was appointed Engineer and Manager. Under his supervision, the works and plant were greatly extended and improved; the latest addition being a spiral-guided gasholder, of a capacity of 500,000 cubic feet, which was inaugurated in June last year, as recorded in the "JOURNAL" at the time.

Mr. Cooke was a member of the first Institution of Gas Engineers, and passed into the present Institution on the amalgamation of the two bodies. He joined the Midland Association of Gas Managers in 1892, and was elected a Member of the Committee in 1897. He discharged the duties of Hon. Secretary, in place of the late Mr. Charles Meiklejohn from 1901 to 1904, and at the annual meeting early in 1905 he was presented with a silver tea and coffee service in recognition of his work for the Association. He was Vice-President in 1910 and 1911, and President in 1912, in which year the members of the Association held their spring meeting at Oldbury, where they were cordially welcomed by the Chairman and members of the Gas Committee, and in the afternoon were entertained at tea in the Botanical Gardens by Mr. and Mrs. Cooke. At the luncheon Mr. Cooke expressed his delight at seeing so many members of the gas fraternity in Oldbury; and said the occasion was a "red-letter day" for him. At the close of his term of office, he became a member of the Committee. He was Treasurer, also President, of the Birmingham Association of Mechanical Engineers.

In connection with Freemasonry the late Mr. Cooke held a prominent position. He was a P.M. of the Godson Lodge, of which for some years he was Secretary. He was one of the founders and the Secretary of the Murdoch Lodge, Birmingham; and was a P.P.G.D.C. of Worcestershire. He was likewise a very active and enthusiastic Church worker.

The funeral took place last Saturday at Holly Lane Cemetery, Smethwick, and was attended by practically all the members and officials of the Oldbury District Council, representatives of the Midland Association of Gas Managers, the Birmingham Association of Mechanical Engineers, Brethren of the Murdoch and Godson Lodges, and a large gathering of personal friends and professional colleagues. The bearers were six of the oldest men from the gas-works, and about thirty others followed the coffin from the deceased's house; almost all the rest of the workmen, and the whole of the staff, being at the cemetery. There were a number of beautiful floral tributes; two being sent by the Midland Association and the Murdoch Lodge.

Mr. Cooke, who was fifty-seven years of age, leaves a widow, two sons, and two daughters. One of the sons (Mr. J. W. Cooke) is the Assistant-Manager at Oldbury, and the other (Mr. A. Douglas Cooke) is Assistant-Engineer at Smethwick.

THE GAS INDUSTRY AND THE WAR.

Captain Arthur J. Martin, M.Inst.C.E., is forming a Second London Sanitary Corps, which has volunteered for service abroad. The chief duty of the new company will be to supervise the water supply and camps and billets, report defects, and instruct the squads of the combatant units. The company will be a branch of the R.A.M.C.T.F., and the men now being enrolled are drawn from the various professions and trades connected with sanitation. This seems to Mr. Horace Boot, the President of the Institution of Municipal Engineers, a grand opportunity for a number of their members (and especially the students) to join the Corps. Those wishing to join may apply to the President, at No. 39, Victoria Street, S.W., or direct to Captain Martin, the Duke of York's Headquarters, Chelsea.

Reference was made in the "JOURNAL" last week (p. 70) to Darwen and its new Munich chamber gas plant—the invention of a German Company—now approaching completion, and in connection with which several German workmen are still located in the East Lancashire district. The local clergy have now taken up the matter of their internment; for in the course of an appeal for homes of the Belgian refugees, they suggest "a more summary and wiser treatment of Germans resident among us." They ask whether it is not a fact that "there are Germans in Darwen still allowed to be at large, to work whatever mischief they can contrive, and to communicate whatever information they can, in roudabout ways, to their own country."

Since the foregoing was written, the Darwen police have taken into custody two Germans, and the men were lodged at the local police station. They are two of a number who came to Darwen in May to erect the Munich gas-making plant; and it is said they are army reservists. When war was declared, a number of the men attempted to respond to Germany's call and to leave the country. They were, however, unable to do this, and returned to Darwen to continue the job at the gas-works. On Friday the two men were taken from Darwen by motor-car to Lancaster, where they are now interned. They had not been brought before a magistrate, and it is not stated that any charge has been preferred against them. It has, however, been established that they are both Army Reservists.

Reference was made by Mr. E. B. Barnard, when presiding at a meeting of the Metropolitan Water Board last Friday, to the members, officers, and servants of the Board who had joined the Colours. Colonel J. B. P. Karslake, Major Whittaker Thompson, and Mr. E. V. Sassoon, he said, were temporarily absent for this reason. Of the officers and men, no fewer than 494 were serving with the Forces, representing 37 per cent. of those of military age. Five of the Board's men were killed by the recent loss of the three cruisers in the North Sea. Many applications for leave to join the Colours had had to be refused, in view to the exigencies of the Board's service. Work such as theirs, on which the public health absolutely depended, could not be carried on without a sufficient number of technical and skilled men to do it. It was therefore impossible for them to encourage many who wished to go; otherwise the public service would have suffered. The Board had been able to render service to the naval and military authorities in other directions. During the past week they had provided no fewer than 1200 men who were required in civil employment by those authorities for various temporary purposes.

Some of the talk of a trade war, said Mr. Edward G. Hillier, in his Inaugural Address a few days ago as President of the Manchester Association of Engineers, proceeded from a confusion of ideas. The true war in the engineer's sphere was intellectual; and by it they ultimately stood or fell. "If, owing to the war," he said, "currents of trade are diverted in our direction, this diversion may only be temporary, unless by advances in our invention, organization, production, or distribution the engineers of this country secure that the product supplied is superior to that which it has replaced, both in suitability and price."

An order was issued last Tuesday night by the Plymouth Fortress Commander (General Penton) that all arc lights, &c., on promenades and piers, and on the exterior of shops and theatres, are to be put out at 8.30 p.m. Lights on clock towers or on the roofs of buildings are not to be used at all.

The Salford Corporation Gas Committee have adopted the proceedings of a Sub-Committee making a gift to the local Relief Committee of 2000 half-hundredweights of coke for distribution. The Marsden Urban District Council have also decided that hundredweight bags of broken coke should be distributed free in approved cases of distress.

Eleven hundred men of the Third Manchester City Battalion spent their first night in camp at the White City, Old Trafford, last Wednesday. The cooking and heating appliances have been supplied by the Stretford Gas Company on generous terms. Indeed, it is stated that they have treated the Organizing Committee most handsomely. The Company have put down the mains into the kitchens free of cost, installed gas-stoves where necessary, and reduced the price of gas some 30 per cent.

GAS ACTS FOR 1914.

[FOURTH ARTICLE.]

THE three previous articles have reviewed the Acts obtained by gas companies during the past session; and in this one the Acts are noticed which were promoted by local authorities, and which treat wholly or in part of matters affecting gas supply. These Acts refer to the group of Bills dealt with in the "JOURNAL" for Jan. 27 last, when fuller particulars were given.

Although the Ashington (Northumberland) District Council had to face the strenuous opposition of the Electricity Company operating in their area, which opposition was supported by the Ashington Coal Company (who are the owners of small gas-works which they have not attempted to seriously develop), the local authority's project for gas supply went through Parliament unscathed. The Council have now full power to set up gas-works of their own, and afford a proper service to their area. An incidental part of their scheme is to take over, for what they are worth (the price to be agreed, or settled by arbitration), the small works and mains of the Coal Company. In all other respects, the conditions of the Bill stand, save that there is no fixed sum mentioned for borrowing powers in respect of the new works; and the Council are to borrow in this regard such sum as may be approved by the Local Government Board. The money required for the purchase of the diminutive gas-works of the Coal Company is to be repaid in thirty years. The North-Eastern Railway Company secured protecting clauses. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Barnsley Corporation have had conferred upon them powers respecting the testing and stamping of gas-meters, in accordance with the clause published *in extenso* when noticing their Bill on Jan. 27 last. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

The Bedwas and Machen District Council have secured the powers sought to enable them to supply gas within the parish of Machen Upper in their district and parts of certain adjoining parishes, and full authorization to erect the necessary works. The estimates for these amount to £10,470. In the calorific clauses, the Council have been allowed the margin between the standard of 540 B.Th.U. gross and 475 B.Th.U. before penalties begin to accrue—the Committee before whom the Bill came being satisfied that the local conditions were such that the further liberty should be granted. But the Council voluntarily adopted the new stipulation as to (in the event of a deficiency on the first test) the average of two tests in one day being taken. The penalties are: Where the deficiency does not exceed 14 B.Th.U. below the 475 B.Th.U., £2; where it exceeds 14 B.Th.U., but does not amount to 28 B.Th.U., a sum not exceeding £5; and for each complete 28 B.Th.U. of defective value, a sum not exceeding £10. Protecting clauses have been inserted in favour of the London and North-Western Railway Company and of Lord Tredegar. The Council are given five years within which to lay mains for the supply of gas in the portions of the parishes of Rudry and Rhydygwern included within the limits of supply; but, after that time, any other would-be suppliers can apply for powers of supply without opposition from the Council. In the Bill as promoted, borrowing powers to the amount of £10,470 for lands and works were sought. The sum has been split up between lands and works £7900, and services, meters, stoves, and fittings, £2570. The amount of working capital, £1000, is the same. The division of the £10,470 was evidently made in order to reduce the period of repayment for the £2570 from forty years to twenty years. The working capital is to be repaid in ten years. In dealing with the application of the revenue, the following provision appears:

> Provided always that, after the expiration of the quarter in which the volume of gas supplied within the portions of the parishes of Rudry and Rhydygwern during that quarter which, added to the volume of gas supplied during the preceding three quarters, shall be ascertained to amount to or exceed 5 million cubic feet, the balance remaining in any year of the moneys so received as aforesaid which may, in the opinion of the Council, not be required for carrying on, improving, or extending the undertaking, and paying the current expenses connected therewith, shall be applied by the Council in equal moieties in reducing to the consumers the cost of gas, and in increasing the district fund.

There are no other changes from the terms of the orginal Bill. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Cleckheaton District Council have in their Act secured all that they asked for in their Bill [see "JOURNAL" for Jan. 27 last] in respect of the rounding-off of their area of gas supply, to make it conform approximately to the boundaries of their administrative area. They are purchasing from Bradford the distribution works in the part of the Corporation area of supply within the Cleckheaton borders; and they have had annulled the powers in portions of territory of the Heckmondwike and Liversedge Gas Company and of the Gomersal Gas Company which those Companies have not supplied. For the purchase money to the Bradford Corporation, a repayment period of 35 years has been allowed. There are in the Act a number of clauses of ordinary form; and protective clauses have been allowed to the West Riding County Council and the Lancashire and Yorkshire Railway Company. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

The Ellesmere Port and Whitby District Council have also,

through their Act, succeeded with their scheme, whereby they are empowered to purchase the gas-works of the Shropshire Union Railways and Canal Company, from which works part of the district of the Council is being supplied with gas. The agreement for sale with the Railway Company was effected on March 12 last; but no price is mentioned in it—this having to be either agreed between them or settled by arbitration. The site of the works the Company desire to retain; and the Act gives the Council power to purchase some 5 acres of specified land for the purposes of new works, together with the right or easement of laying a tram line or railway siding across the Cromwell Road so as to obtain access to the railway sidings in connection with the Wolverhampton Corrugated Iron-Works. The limits of supply include the district of the Council and the parishes of Chorlton, Croughton, Little Stanney, and Stoke, all in the County of Chester. The parish of Overpool was also desired by the Council, but has been excluded—this being an area included in the district of the Sutton and Hooton Gas Company, in which their powers had not (perhaps even now have not) been exercised. The proposed maximum price of gas has been reduced from 5s. to 4s. 6d. The calorific clauses follow the terms of the decision on the Gas Light Company's Bill; and the penalties are on the lower scale, as in the Bedwas and Machen Act noticed above, with the penalty line at 7½ per cent. deficiency. The Chester County Council and the London and North-Western and Great Western Railway Companies have secured protecting clauses. In the clauses in favour of the County Council, there is one which, in our opinion, is far too loose in its terms:

> The County Council shall not be liable for, or in respect of, any injury which may be caused to any main, pipe, or other work of the Council by reason of such work being at a depth below the surface of any such road, or the roadway forming part of any such bridge or approach, insufficient for its protection from injury from, by, or in consequence of, the proper exercise of any of the powers or duties for the time being vested in, or imposed upon, the County Council as a road or bridge authority, and the use by the County Council of a steam-roller for the repair of any such road, bridge, or approach shall not be deemed to be an unreasonable exercise of such powers and duties.

We have referred to this clause in our editorial columns. The Council have obtained the other powers—electricity and otherwise—mentioned when noticing the Bill in January. The financial authorization is also the same; but the period of repayment in respect of three items has been reduced. The money required for the purchase of the works from the Railways and Canal Company is to be repaid in 25 years, instead of 40 years; the money spent on the erection of new works is to be repaid in 40 years, instead of 45 years; and the money spent on services, meters, stoves, and fittings is to be repaid in 10 years, instead of 20 years. [*Parliamentary Agents: Messrs. Baker and Sons.*]

The City of London (Various Powers) Act [*Parliamentary Agents: Messrs. Sherwood and Co.*] and the London County Council Act [*Parliamentary Agents: Messrs. Dyson and Co.*] contain the new legislation respecting the testing and stamping of high-pressure gas-meters. The clauses (as agreed with the opposition) were set out in full in our issue for July 7, pp. 39-40.

The Manchester Corporation Act contains clauses for the protection of the public in connection with the retailing of coke in small quantities. Power is also conferred for the attachment of brackets, wires, &c., to buildings for public lighting. Protection in this connection is given to the buildings and structures of Railway and Canal Companies. The Stretford Gas Company have also secured a series of protecting clauses in relation to "constructing, providing, and laying, or relaying and repairing any gas mains, pipes, or apparatus in substitution for any mains, pipes, or apparatus belonging to the Gas Company which may be displaced, disturbed, injured, or rendered unfit for use by, or in consequence of, any of the works authorized by Parts V. and VI. of this Act." These "Parts" refer to the electricity and main drainage works. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

In the Middlesbrough Corporation Act, the scheme for the purchase of the North Ormesby Gas Company's property is confirmed. The purchase actually took place from Jan. 1 last; and it is seen that since the Bill was reviewed by us, there has been agreement as to price. The works pass into the hands of the Corporation, "discharged from their existing mortgages (if any) and other financial obligations and liabilities of the Company, for the sum of £26,000." Within one month from the passing of the Act, the Corporation were to pay the Company the purchase money, together with interest thereon at the rate of 5 per cent. per annum from the date of purchase up to the date of completion. If the completion of purchase did not take place within one month, then the Corporation were to pay an additional 1 per cent. (making 6 per cent.) from the expiration of the month until the completion of the purchase. Provision is made for compensation to the Secretary and Manager. The limits of supply of the Corporation are extended to the parish of Hemlington. The Bill as lodged provided for a calorific standard (in lieu of the illuminating power one) in terms of calories net; but we are pleased to see the expressions are altered to "B.Th.U." and "gross." The Gas Light conditions now appear—penalties being on the lower scale [see Bedwas and Machen Act]. It is well known that the Corporation are contemplating the purchase of coke-oven gas in bulk; and, in connection therewith, this clause gives the power:

> The Corporation may enter into, and carry into effect, agreements with any company or person for the supply of gas, in a crude or partially purified state, by such company or person to the Corporation for such remuneration, on such terms and conditions, and for such period as the Corporation may think fit.

Provision is made for the attachment of brackets to buildings. The Corporation have obtained power to borrow the sum requisite for the purchase of the North Ormesby Company; but the repayment period has been reduced from forty to thirty years. Power has been given to the Corporation to pay out of the borough fund, as expenses incurred by them under the Municipal Corporations Act, 1882, reasonable subscriptions, whether annually or otherwise, to the funds of any association of municipal corporations or other local authorities or their officers, formed for the purpose of consultation as to their common interests and the discussion of matters relating to local government, and any reasonable expenses of the attendance of any member or officers of the Corporation (not exceeding in any case four) at conferences or meetings of such associations or any of them, and the cost of purchasing reports and contributing to the expenses of the proceedings of any such conferences or meetings. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

In the Ossett Corporation Act, additional gas land powers are secured. Authorization is given to lay mains, for the purpose of supplying gas within the Corporation limits, along so much of the Wakefield to Dewsbury main road as lies within the county borough of Dewsbury, and runs adjacent to the Ossett borough boundary. Protecting clauses are granted to the Wakefield Rural District Council. In substituting the calorific standard for the illuminating power standard, it is provided that—

> If and whenever the Corporation shall so alter their gas-works as to enable them to supply gas to consumers in the urban district of Horbury from and by means of a separate gasholder, from and by means of which gas shall not also at the same time be supplied to consumers within the borough, the Horbury Urban District Council, at their own expense, may provide and maintain a testing-place within the said urban district, and may therein provide and maintain apparatus for testing the calorific power of the gas mentioned in this section, and such testing-place shall be a prescribed testing-place within the meaning, and for the purposes, of the provisions of this section.

Before an official test is made at such station, notice of not less than two hours is to be given to the Corporation. In proposing in the Bill the substitution of a calorific standard in place of the illuminating power one, the Corporation asked for 520 B.Th.U. gross, with freedom from penalties until there was a deficiency below 475 B.Th.U. gross. The Gas Light terms appear in the Act, with penalties on the lower scale. The other clauses are of ordinary form. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

By their Act, the Portcawl District Council (in conformity with the purchase clause inserted in the Company's Act in 1913) obtain power to purchase the local gas undertaking. A number of the clauses in the Company's Act of last year apply to the Council. The other clauses are practically the same as were noticed in the review of the Bill on Jan. 27 last. The calorific value conditions have been slightly modified. The penalty line of 475 B.Th.U. gross has been allowed; and the forfeitures are on the lower scale. The Council have been authorized to borrow the requisite sum for the purchase of the Company's works; £10,000 for the extension and improvement of the undertaking; and working capital up to £1000. For the repayment of the purchase money 35 years have been allowed (instead of the 40 years desired); for the repayment of the money borrowed for extensions and alterations, 25 years have been granted (instead of 40 years); and for the working capital 10 years. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Preston Corporation secured powers for the purpose of regulating, for the protection of the public, the sale of coke in small quantities. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

By their Act, and through one section, comprising five clauses, the St. Anne's-on-Sea District Council are invested with the right, at any time within two years, to purchase, with the sanction of the Local Government Board, the property of the Gas Company at an agreed price. In the electrical clauses, the Council are empowered to supply electrical energy to the Lytham District Council. Any money required for the purposes of the gas undertaking will be granted under the sanction of the Local Government Board. [*Parliamentary Agents: Messrs. Baker and Sons.*]

The Skegness District Council Act does not contain the gas-works purchase clauses with which the measure entered Parliament; but in the Gas Company's Bill (it will be remembered) a purchase clause operative in the next session of Parliament was inserted. [*Parliamentary Agents: Messrs. Baker and Sons.*]

The Thornaby-on-Tees Bill was withdrawn after its initial stages had been passed.

Lastly, the "Omnibus" Bill of the Walsall Corporation embraces a number of gas and electricity clauses. The prescribed illuminating power of the gas is to be 13 candles when burned, in a "Metropolitan" No. 2 burner at the rate of 6 cubic feet per hour. Suitable burners are to be supplied to flat-flame users who, within two years, express a desire for them. Within three months, the flat-flame burners of prepayment meter users are to be changed. Liability to penalty for sulphur compounds other than sulphuretted hydrogen is removed from the Corporation. Power is given respecting the attachment of brackets to buildings. Other clauses are of quite normal order. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

ELECTRICITY SUPPLY MEMORANDA.

Business and the War.

THE electrical industry can hardly fail to have much the same experience as the gas industry is having in connection with business during the war, excepting that it is not shackled with certain residual products which cannot just now be disposed of in the normal way. For the moment perhaps, this is a fortunate thing for our competitors, because present gas prices are founded on pre-war conditions, and before market prices for residuals began falling down a hill of rather acute incline. Electricity suppliers are now having a somewhat bad time where their larger custom is concentrated in shops and the theatres, with a fair proportion of street lighting. In all these directions, there has been dwindling consumption. Mr. A. H. Seabrook, of Marylebone, reports that, owing to the war, large trading consumers have diminished their demand for current; but, on the other hand, residential consumption appears to have been increasing, owing to householders being at home when in ordinary circumstances they would be in the country or abroad. This simply means that some other concerns have been losing custom; and there is no doubt that it will be eventually found that the undertakings operating in seaside resorts have been heavily cropped of business during the holiday season. The experience of the Marylebone Electricity Department is the experience of many gas undertakings; so is the experience of Stepney and West Ham—industrial centres that have been very busy in consequence of the war. There are other industrial centres—up Lancashire way, for instance—that can tell a tale different from that of Stepney and West Ham.

Marylebone Policy.

Prior to the war, Mr. Seabrook found the lighting business almost stationary—that was during the June quarter. But he is persistent; and, like the gas industry, he does not believe—even under the circumstances of a European war—in dropping publicity and canvassing. Both proceed as hotly as ever in Marylebone, and in not a few other places. His reason for the stationary character of the lighting business is a compliment to the Gaslight and Coke Company. He says, although there is a large field for electric lighting in the borough, most of the possible consumers are those who have been secured by the Gas Company by means of free-piping, hire-purchase, and other hiring schemes. The loudly-proclaimed "advantages" of electricity, it is tacitly admitted, are not sufficient to counteract this condition of things; for Mr. Seabrook declares that, in spite of all that has been done by his department—in publicity, in business-promoting schemes, in canvassing, and by a wonderful assortment of tariffs—it is necessary to put before householders some still more attractive project, to give a push to the lighting business. It would be necessary to lay out considerable sums on free-wiring (recovering the cost by weekly or monthly payments), and to relax guarantees. We venture to say that there are few members of the Marylebone Electricity Committee who could reel off, without reference, the details of the marvellous compilation of tariffs and schemes for developing business to which their Engineer and Manager has given birth. He has a great *penchant* for experimental commerce; and he rarely appears without offering something new, either in substitution of, or in addition to, a plan that he has proposed before. So Marylebone goes on, with a constant change in the programme. But the stationary character of the domestic lighting business notwithstanding, Mr. Seabrook does not seem to think much of the free-wiring and heavy outlay project. We opine that, like other electrical engineers, he looks upon it as a burden that does not richly pay for itself. So he advises that the best policy is to concentrate effort on securing loads for cooking and heating, because "the income received in proportion to the cost is more favourable." This is a point open to dispute. The lighting business remains the backbone of the undertaking.

The Southampton 0·5d. per Unit.

The report that Sir John Snell and a professional accountant recently made on the Southampton electricity undertaking, with especial reference to the question of the charge of 0·5d. for current used for cooking and heating has been before the Council. There were speeches made—some bold, some rambling, and few to the point—for and against the report; and there were little "scenes" such as delighteth the heart of the local newspaper man. In the end, the Electricity Committee were instructed to report on the expert's report; and a nice mess we daresay they will make of it, unless the Electrical Engineer comes to their aid, and dots the "i's" and crosses the "t's" of the latter. The experts whitewashed the Committee; but certain of their points were somewhat equivocal, as we showed in a comment soon after the report was published. In one place, they said in effect that, though the ½d. could not perhaps be justified standing alone, taken as a whole its influence upon the undertaking generally was not bad. The natural inference is that there is such comparatively little business done in cooking and heating that the adverse influence of the ½d. is not seriously felt. But what Sir John and his fellow reporter truly think of the ½d. is made sufficiently plain by the recommendation that in future a lump sum on the rateable value should be charged, *plus* the ½d. per unit. There is more in this recommendation than in all else that was said by them on the subject of the ½d.

The B.Th.U. Value for Money.

The electrical people at times get very savage, very verbose, and very unreliable when gas people tell (as they invariably do) the truth about electric cooking. The Harrogate Gas Company have been informing the good people of the town that a pennyworth of electricity (sold at 1d. per unit) will only give the user 3420 B.Th.U., and that a pennyworth of Harrogate gas will provide the user with 16,666 B.Th.U. Mr. George Wilkinson, the Electrical Engineer, has slated the Gas Company for this honest version of the relative positions. The plain fact remains that whether for baking, boiling, frying, grilling, or any other purpose for which gas and electricity are used (and electricity serves, comparatively with other agents, certain of the purposes very badly and very wastefully), as the electrical method has not 100 per cent. efficiency to its credit, some 14,000 B.Th.U. of the gas can be wasted before the cost will begin to exceed that of the unit of electricity. Mr. Wilkinson, in his public reply to the Gas Company, says: "The question of cost depends upon the efficiency in practice; and while the gas-cooker has a higher efficiency than the kitchen range, so also the electric-cooker has a much higher efficiency than the gas-cooker." Our Harrogate friend leaves off here, and does not enter into details which are dangerous. But he adopts one of the effete stock arguments of the electrical shop, that "the electric-cooker has an outstanding advantage over both the gas-cooker and the kitchen range in that the shrinkage of meat during cooking is very much less, while the flavour and digestibility of the meat are greatly improved."

The Disappearing "Meat."

We had thought that Mr. Wilkinson stood well above that form of humbug. But not a bit of it. He professes (like the rest of the electricals) a belief which answers his purpose. He tells the Harrogate public that a 7-lb. joint roasted in an electric-oven provides 6¼ lbs. of cooked meat for the table, while cooked in a gas-oven it would provide only 5¼ lbs. Ancient Mrs. Beeton again! This 25 per cent. of shrinkage in meat cooked in a discarded form of gas-cooker is made to help to keep her memory green by the thankful electricians. We do not know whether the following is from Mr. Wilkinson's poster, or is merely the comment of the "Electrical Times." We read that "there is ample evidence to prove that the extra amount of meat obtained by cooking in an electric oven is of much greater value than the cost of the current used in cooking." Where is the ample evidence? Has Mr. Wilkinson or any other electrical engineer taken part in a real, open competition in which a modern gas-cooker is tested against the modern electric-cooker, and costs found for all the heat-requiring operations attending the preparation of a dinner up to the provision of the hot water for "washing-up" purposes? Have they ever had a competition to show the relative time occupied in preparing (say) a four or five course dinner, from beginning to end? Have they ever had a competition to show the relative simultaneous working capacity of an electric-cooker and a gas-cooker? Have they ever had an electrical cooking expert and a gas-cooking expert dealing with two similar joints of meat at equal temperatures and cooking them to an equal degree? No! Then where is the ample proof? Mr. Wilkinson does not tell the Harrogate people why it is imperative there should be a 25 per cent. "meat" loss in the gas-cooker, if the user does not wish to have such a loss. He does not tell them, for the simple reason that he knows he cannot do so. However, there is more nonsense on the shrinkage question in the "Electrical Times" comment on the Harrogate electrician's poster; and this nonsense is described as "proved facts that the gas people cannot attempt plausibly to deny." These so-called "facts" are denied, because we know that cooking and boiling of all kinds are done daily in the gas-oven and over the top plate, the results of which show that electrical imagination works to suit electrical requirement. Thus electrical imposture.

Displacing Arc Lamps.

Further towns are making a partial clearance of arc lamps from the streets owing to the carbon shortage, and are putting in "half watts" in their place. Stoke Newington and Exeter are additional examples at home; but Chicago, which is not troubled by the carbon question, is going to make the change on the grand scale. For some time past, the authorities there have been experimenting with 300-watt lamps of the "half-watt" type. By the beginning of September, there were 728 of these lamps in use; and the substitution by them of arc lamps is to continue until there are some 15,000 in use, as well as 2700 75-watt 100-candle power lamps for the streets of residential districts. The type of flame arc lamp installed (450-watt) was only adopted as a standard some two years ago. A serious defect of these lamps has been found by the Chicago street-lighting authorities. The flame arcs give a maximum of 1150-candle power, in a direction near 30° below the horizontal, in a laboratory test; but the deposit on the inner globe soon greatly reduces the light transmitted. The transmission efficiency of a new clear inner globe is 92 per cent.; but, after several months' service, this falls to 47 per cent. of the light that is generated. In ordinary service in Chicago, the transmission efficiency is about 55 per cent. The new tungsten lamps are said to give an average maximum of

600-candle power. They will not do so if the consumption is only 300 watts. However, it is asserted that, on the whole, the lamp gives nearly equal illumination with the flame arc lamp, and that a reputed 1150-candle power one! When, in addition, electrode and lamp renewal costs, trimming, cleaning, and energy costs for the arcs are considered, the Chicago city engineers arrive at the conclusion that the cost of maintenance of the two types will be about equal for equal illumination if the tungsten lamps last 1000 hours. But even if their life is less than this, the manufacturers' guarantee, the report says, is in favour of the new lamps. Things certainly look bad for the arc lamp.

The "Half-Watt" Pretender.

An "Engineering Correspondent" has been contributing some notes on the half-watt lamp to the "Illuminating Engineer." We do not find very much that is new in the notes; but they serve as a digest of published knowledge, and so refresh one's memory. There are two or three points upon which we may here incidentally touch. The author agrees that it is rather too early to give full data as to the life of these lamps. It has recently been seen from descriptive articles what a great deal of personal care and accurately operating machinery are required in the manufacture of these lamps; and the care and accuracy were evidently absent in the earlier introductions of the lamp, if some of the experiences with them go for anything. As to the efficiency of the lamps, the writer shows that most "half-watt" lamps run at an efficiency of 1 candle per 0·65 watt. This is getting close to some tests in which we were interested a time ago, in which the efficiency was 1 candle per 0·7 to 0·75 watt. The writer also comments on the necessity of properly shading the lamps, on account of their high intrinsic brilliancy. If the lamps are going to displace arc lamps in the streets, this will have to be made an inviolable condition, if the eyes of drivers and pedestrians are to be protected. Then the useful efficiency will not be anything like 1 candle per 0·65 watt. Dealing with the prospects of further developments in efficiency in this form of lamp, the writer of the notes doubts the possibility of advance, in view of the physical difficulties—the melting-point of tungsten, and the conduction of heat by the inert gas used for filling the bulbs, which would be a serious matter with small-unit lamps with their necessarily thin wires in comparison with the stouter wires used in the high-power lamps. If small-unit lamps cannot be made of this type which will give a higher efficiency than 1 candle per 0·65 or 0·75 watt, then it hardly seems worth while attempting to make them. The cost (initial and renewal) to the consumer must always be higher than the older-type metal filament lamps; and he might just as well spend his money in current as on additional lamps—from the station point of view, if not from that of certain lamp makers.

QUALITY OF LONDON GAS

For the Third Quarter of the Year 1914.

We give below our customary summary of the results of the testings, made in the testing-places controlled by the London County Council, of the gas supplied by the three Metropolitan Companies during the third quarter of this year, together with the comparative figures for the corresponding quarters of the two previous years. The period referred to as the third quarter of this year is the thirteen weeks ended Sept. 26. The full summaries for the third quarters of 1912 and 1913 appeared in the "Journal," Vol. CXX., p. 278, and Vol. CXXIV., p. 354, and the summary for the previous quarter of the present year was published in the "Journal" for Aug. 4 last, p. 279.

Illuminating Power.

The averages of the results of testings of illuminating power with the standard No. 2 "Metropolitan" burner and the prescribed flat-flame burner are shown in Table I. The average illuminating power with the standard argand is appreciably lower than in the corresponding quarter of 1912-13 for the South Metropolitan Gas Company only; but the flat-flame testings show an appreciably lower result for all three Companies. The lowest return for the argand burner was 12·88 for the Gas Light and Coke Company, 13·97 for the South Metropolitan Gas Company, and 12·89 for the Commercial Gas Company, The weeks in which the returns of 12·88 and 12·89 candles were made for the Gas Light and Coke and the Commercial Gas Companies respectively were the only weeks when returns below 13 candles were reached. According to their Acts, the Companies are liable to incur a forfeiture in respect of every day on which a return below 13 candles is recorded, unless the Company can show to the satisfaction of the Chief Gas Examiner that the deficiency was due to some unavoidable cause. In six other weeks of the quarter minimum returns between 13 and 13·5 candles were reported for the Gas Light and Coke Company, and the Company will have become liable to a forfeiture in respect of each of these returns if they have not, with the return for the preceding and following days, given an average of 13·5 candles or over. The Commercial Gas Company had no return, other than the 12·89 candles already mentioned, below 13·5 candles. The minimum returns for the flat-flame burner in the quarter were: For the Gas Light and Coke Company, 6·22 candles; for the South Metropolitan Gas Company, 7·07 candles; and for the Commercial Gas Company, 5·85 candles. The new Act of the Gas Light and Coke Company does away with the liability of this Company to penalties in respect of all illuminating power testings.

Table I.—*Averages of All the Testings of Illuminating Power for the Third Quarter of the Year* [*Candles*].

Company.	No. 2 "Metropolitan" Argand.			Flat-Flame.		
	1912.	1913.	1914.	1912.	1913.	1914.
Gaslight and Coke .	14·54	14·38	14·31	8·37	8·32	7·96
South Metropolitan	15·44	15·52	15·17	9·35	9·54	8·91
Commercial . . .	14·83	14·54	14·46	8·41	8·39	7·85

Calorific Value.

Table II. presents a summary of the results of the testings of calorific value during the second quarter of this year and of 1912 and 1913. The average calorific value shows an appreciable diminution in the case of both the Gas Light and Coke Company and the South Metropolitan Company. The minimum return of net calorific value of 109·8 calories for the Gas Light and Coke Company is lower than the standard of 112·5 calories, to which the Company are required to work by their Act of 1909 on the mean of three consecutive days' testings. The week in which this return was made is the only one in which the Company's gas showed a return below 112·5 calories net. The other two Companies have no statutory liability in respect of calorific value; and only the one test of 110·9 calories net for the Commercial Company is below the standard to which the Gas Light and Coke Company work. The minimum return of gross calorific value for the Gas Light and Coke Company—viz., 121·7 calories—is equivalent to 482·9 B.Th.U. per cubic foot, which is appreciably below the standard of 499 B.Th.U. gross prescribed in the Company's Act of this year for the total heating value of the gas.

Table II.—*Summary of Testings of Calorific Value* (*Gross and Net*) *for the Third Quarter of the Year* [*Calories per Cubic Foot*].

Company.	Average.			Maximum.			Minimum.		
	1912.	1913.	1914.	1912.	1913.	1914.	1912.	1913.	1914.
Gaslight and Coke—									
Gross	135·5	136·5	133·8	144·3	144·3	148·8	125·6	127·4	121·7
Net	120·8	121·8	119·7	129·3	129·1	134·1	110·2	114·2	109·8
South Metropolitan—									
Gross	143·1	143·2	139·2	153·1	156·2	150·1	131·7	135·0	127·9
Net	127·4	127·6	124·1	137·7	139·1	133·5	116·6	119·7	114·5
Commercial—									
Gross	135·9	134·0	133·8	149·6	147·3	143·9	126·2	123·1	124·3
Net	121·8	120·3	119·8	134·4	132·7	129·7	112·3	110·7	110·9

Sulphur.

The average and maximum figures for the sulphur testings during the year are given in Table III. The gas supplied by the South Metropolitan Company again shows a marked decrease in the sulphur content, and there is also an appreciable decrease in the case of the Gas Light and Coke Company's supply. No abnormal maximum figures have been recorded during the quarter for any of the Companies.

Table III.—*Summary of Testings of the Sulphur in London Gas for the Third Quarter of the Year* [*Grains per* 100 *Cubic Feet*].

Company.	Average.			Maximum.		
	1912.	1913.	1914.	1912.	1913.	1914.
Gaslight and Coke .	35·7	34·0	30·9	52·5	49·4	52·7
South Metropolitan.	24·3	23·4	18·8	43·0	54·6	43·3
Commercial . . .	30·7	29·1	30·3	42·1	54·7	58·3

Gas Companies' Protection Association.

Mr. Fred. E. Cooper (the Secretary) intimates that the seventeenth annual general meeting of the Association will be held at the Westminster Palace Hotel next Thursday (the 22nd inst.). In addition to the reception of the report and accounts, the business will include the election of six gentlemen to serve on the Committee in place of those retiring, and the consideration of certain additions to the rules. The retiring members of the Committee are Mr. Thomas Berridge, Mr. Frank Bush, Mr. Henry Hart, Mr. A. A. Johnston, Mr. H. E. Jones, and Mr. W. R. Phillips, all of whom, with the exception of Mr. Bush and Mr. Hart, offer themselves for re-election.

Mr. Robert Hesketh Jones, whose death in his 87th year was recorded in the "Journal" for Aug. 11 last, left estate of the gross value of £76,734.

WORKS TOPICS.

By "Modus Operandi."

Sight-Feed Lubricators.

Last week much was said in favour of the needle lubricator. In regard to cheapness, simplicity, and the economy with which it uses oil, it is difficult to praise it too highly. Further, it needs so little attention—a matter of importance where bearings are in awkward places. For many purposes, however, it is impossible to use a lubricator which works on this principle. There are, on the one hand, many mechanical movements that could not be lubricated in this way; and on the other hand there are many bearings which, it is obviously desirable, should be fed in the most positive manner by a regulated number of drops through a sight-feed arrangement. The needle lubricator, though very efficient and suitable where the consumption of oil on a particular bearing is light, and where the extra expense of a sight-feed lubricator is hardly justified, must be considered as unsuitable where these conditions do not apply.

The sight-feed lubricator, being easily adjustable to one drop or twenty drops a minute, lends itself to efficient lubrication at a minimum of expense. The careful manager will standardize such details, giving instructions as to the regulation of these lubricators. Considering that one bearing will consume many gallons of oil in the course of twelve months, it is well worth while spending a few minutes determining the correct feed for such a bearing, with a view to giving the necessary instructions. This type of lubricator should, of course, be fitted with a glass reservoir and a spring-seated valve, so that when the engine is at rest the valve is kept upon its seating by the pressure of the spring, which may be put in or out of action by means of a clip hinged to the top of the spindle.

It may fairly be assumed that the engine driver, or other man in charge of engines and machinery will use, if left to his own devices, two or three times as much oil as is actually required. He wishes to be on the safe side, and is accordingly wasteful, quite oblivious of the expense of his methods. For such matters he cares not at all. It can, therefore, be taken for granted that unless the manager concerns himself with the details, this waste will continue.

Syphon Lubricators.

Syphon lubricators (of which so many are in use) are not to be recommended. Being dependent for their working on the tightness or looseness with which the strands of worsted are threaded within the tube leading to the bearing, there is obviously a great deal of uncertainty in the feed of oil. The mere fact that there is some uncertainty causes the man in charge to "make sure"—always leading to wastefulness. It is at the best a crude method of regulating the feed. Small faults in adjusting the worsted cause relatively large variations in the flow of oil. Besides this type of lubricator is open to the objection that when the engine is stopped, oil will still continue to flow unless the worsted is withdrawn. This is also true of the sight-feed lubricator—a disadvantage which does not apply to the mechanical lubricator or to the simple needle type.

To summarize the recommendations contained in these articles reasons have been given for favouring the adoption of:

1.—Mechanical lubricators, wherever the expense is justified by the importance of the lubrication or the consumption of oil—both for gas and steam engine cylinders and for ordinary lubricating purposes.
2.—The Graphiter type of lubricator in special cases, particularly on the cylinders of continuously-worked gas-engines.
3.—Lubricated steam where the conditions are suitable.
4.—Sight-feed, or
5.—Needle lubricators for all other bearings and parts of engines and machinery that require lubrication.

And the abolishing of:

6.—Oil holes without properly-fitted lubricators.
7.—Syphon lubricators.
8.—Tallow cups on steam cylinders.
9.—Sight-feed lubricators (in most cases) on steam cylinders, in favour of mechanical lubricators or lubricated steam.

Oil Filtering.

An important method of economizing which does not always receive the attention it deserves, is the question of collecting all oil drips in pans placed underneath the lubricators. After filtering, the oil can with absolute safety be re-used for the same purpose, at any rate for all but important bearings.

As a case in point, the writer has for years followed the practice of using fresh oil on the bearings of the blast fan in a carburetted water-gas plant. The used oil is collected and passed through a Wells' oil filter, after which it suffices for the lubrication of the whole of the rest of the plant, including the fan engine, exhauster engine, circulating boiler-feed, and oil-pumps, and the main shafting of the blast fan. The oil collected from these points is again used for various purposes on the works. Such methods lead to a good deal of economy which should not be disregarded. In one engine room the adoption of the methods already described soon reduced the consumption of oil from 30 to 12 gallons per week without any reduction in efficiency.

Lubricating Oils.

In regard to the grades of oil for different purposes, it is unnecessary to employ expensive oil for the usual requirements of a gas-works. Fancy prices are no guarantee that the oil is superior. Having many years ago been instrumental in discarding expensive in favour of cheap lubricating oils, the author has never had any reason to regret the change—firmly believing that the higher price was paid to no purpose, and that there was no corresponding advantage in quality.

The oils, of which a lengthy experience has been gained, may be described as follows: For gas-engine cylinders and all ordinary lubrication, the same oil is used. It is a pure mineral hydrocarbon oil, of pale amber colour. Being perfectly neutral, it has no action on the metallic surfaces with which it is brought into contact, while it leaves no deposits. The freezing-point of this oil is extremely low.

Specific gravity at	60°	Fahr.	·910
Viscosity	,, 60°	,,	1870
,,	,, 100°	,,	415
,,	,, 180°	,,	67
Closed flash	,, 385°	,,	
Open ,,	,, 410°	,,	
Fire test	,, 462°	,,	

Price (before the war), 1s. to 1s. 2d. per gallon in barrels.

For special lubrication of a particular nature. A pure mineral hydrocarbon oil of pale amber colour with characteristics similar to the above grade.

Specific gravity at	60°	Fahr.	·908
Viscosity	,, 60°	,,	1330
,,	,, 100°	,,	340
,,	,, 180°	,,	55
Closed flash	,, 380°	,,	
Open ,,	,, 405°	,,	
Fire test	,, 460°	,,	

Price (before the war), 1s. 3d. per gallon in barrels.

In a gas-works in which a great deal of machinery is in use, this oil is only used for the lubrication of the fan-bearings of a carburetted water-gas blast fan. For all other purposes the first-named oil is employed.

Cylinder oil. A pure mineral hydrocarbon oil of dark green colour. Free from acid. Very high flash-point and fire test. Of suitable viscosity at working temperatures; and of sufficient fluidity at lower temperatures.

Specific gravity at	60°	Fahr.	·899
Viscosity . .	,, 100°	,,	2190
,, . .	,, 180°	,,	250
,, . .	,, 212°	,,	130
Closed flash .	,, 525°		
Open flash .	,, 555°		
Fire test . .	,, 610°		

Price (before the war), 1s. per gallon delivered in barrels.

These particulars will enable any reader, who wishes to do so, to obtain exactly similar oils from his usual sources of supply. Those in the trade will recognize from the above specifications the exact grades of oil required.

AN INQUIRY AS TO TAR PRODUCTION, &c.

A letter was lately addressed by Mr. John Bond (the President of the Institution of Gas Engineers) to all the gas undertakings in the United Kingdom, asking for information as to the annual production of tar in tons, the amount sold to distillers or merchants, and their names and addresses, and whether tar is distilled at the gas-works. In the latter event, particulars as to the quantity of products obtained were desired. Information was also sought with regard to the ammoniacal liquor produced, cyanides, sulphur recovered, sulphur sold in spent oxide, sulphate of ammonia made, and other ammonia compounds. A printed form was enclosed containing the questions to which replies were wished for, not later than last Thursday.

The object in making this inquiry on a matter which, Mr. Bond said, "is of vital importance to the gas industry" was explained in his letter, in which he pointed out that, owing to the war crisis, great difficulty is being experienced in various industries in obtaining sufficient colours, dyes, and other refined products, to meet requirements; the greater proportion of these materials having hitherto been imported from Germany. Several Committees have this important matter under consideration, to assist in which the Institution have been requested to obtain information with respect to the quantity of coal tar produced by the various gas undertakings in the United Kingdom, and of chemicals manufactured therefrom.

American Gas Institute.

The ninth annual meeting of the American Gas Institute is being held this week in the famous Hotel Astor, New York City—starting to-morrow (Wednesday). The list of papers to be presented at the five sections into which the proceedings have been divided was given in the "Journal" for Sept. 22, p. 669. There are, in all, 34 papers and reports to be considered, and the comprehensive and valuable technical programme thus prepared has doubtless ensured an exceedingly good attendance of members and visitors—apart from the many social functions which are always an attraction at such gatherings.

THE GROWTH OF THE USE OF ELECTRICITY IN GAS-WORKS.

Convenience and the Private Gas-Driven Generating Plant.

Almost imperceptibly, a large change has come over the face and practices of gas-works. Among the several introductions of this century has been that of the use of electricity for motive power. There can scarcely be a large gas-works in the country to-day that has not its installation of electricity for motive power; and, through new plant, the area of electricity application extends annually in these works. This is one of the things about gas-works that our electrical friends profess not to understand. They accuse gas engineers and managers of being heretical, and, by their practices, of applying the negation to their dogma that gas for power purposes is cheaper than electricity. Our friends pretend to utilize all the casuistical laws with which they are acquainted in trying to fathom these practices which they suggest are a contradiction of preachings, and they assert a resulting failure. Pretence is a well-cultivated art with some people. The position of the gas industry is clearly defined in this matter. The industry—largely as it has adopted the electric drive for its own operations—does not recede in the slightest degree from the position that the regulated gas-engine is, on sound competitive lines, a cheaper producer of power than the electric-motor; nor has the industry ever swerved from the position that convenience is a factor to be taken into consideration, and that for some purposes—especially where the work is tractive, or at several scattered points—electricity takes precedence of the gas-engine, and certainly of steam, owing in the latter case to the greater facility and economy of distribution.

Example for Other Industrial Users of Electric Power.

In such cases, however, the gas-engine, as a rule, becomes the prime mover in the generation of the electric current, and the cables the distributors in convenient form of the work done by the gas-engine. There are a few gas-works in the country—municipal ones chiefly, with a sister department in the electricity concern—that take their electrical energy, if it is supplied to them at a low rate, from the corporation electricity distributing system, but even in these cases we venture to say that most of the engineers would preferably have their own duplicate gas-engine driven generating sets for safety sake and the comfort of reliability. We know of stoppages of gas plant through something that has happened at the municipal generating station or on the town distributing system; and apart from the inconvenience on the gas-works itself, and the uneconomy of a dislocation of work through the cessation of the power supply, it is better, as a matter of policy, that the supply of light, heat, and power from the gas-works should be quite independent of any failure of an extraneous operating power. It is true that, in the case of gas, the storage holders are a protection for the consumers in the case of any temporary breakdown of whatever kind; but disturbances in the even tenour of the operations are (as already said) both inconvenient and uneconomical.

The large experience in gas-works of the economy and safety of independent generating plants should be a valuable and suggestive illustration for other industrial users of electrical energy. Those managers of gas-works with an electrical distributing system limited to their boundary walls, and with duplicate gas-driven generating sets on the works, or a large set and a small one for stand-by purposes and for running at periods of light load, have no fear of breakdowns, and power production is entirely under their own command; or, as an alternative, if a single private generating plant is installed of the same voltage as the town supply, the latter can, for a small consideration, be used as a stand-by, to be brought into use in the event of a breakdown of the private plant, or a laying-off for cleaning or repair. The same experience can be, and is, obtained by other industrial concerns; and the prospect is that this kind of thing will extend—the gas industry's own experience qualifying it for the prosecution of business with this particular form of equipment, where, as in its own case, the electric drive has the advantage of convenience either through the character of the work or the disposition of the plant. There are some members of the gas profession (they are however few in number) who will not concede that for some purposes the electric drive is superior to the gas drive; but their want of condescension in acknowledging the truth does not at all alter the fact. Their own experiences, too, must show them that there are men in various industries who prefer electricity to gas for power purposes. The best course, therefore, to pursue in this matter is undoubtedly to advocate the economy of the gas-engine where there is grouped machinery in use which can be economically driven by shafting, or where there is constant work to be done by a single machine which can fully engage a gas-engine; but, for driving small scattered machines, or for traction work, or for machinery the operating parts of which have to be raised or lowered, the electric-motor has no rival for convenience. In those cases where the load is sufficient to justify a private generating plant, the gas-engine comes in, with undisputed right, as the means of providing, through the private plant, the power for the generation of the current.

Accomplishments and Relations.

At one time, the use of electricity on gas-works was unknown. The development of gas-works practices has made it a thing very much known; and it has helped to extend the requisite accomplishments of the gas engineer. From being the constructional engineer and manufacturing and commercial manager of the old days, he must now, in addition, be a mechanical engineer, electrical engineer, and (in some cases) a railway engineer, a marine engineer, and a hydraulic engineer, as well as a chemist, and, more than ever, a good commercial man. There is talk of the electrical engineer trying to emulate the gas engineer. It is suggested that the future of electricity production for general purposes will be reached *viâ* gas-producers with recovery plant, and the coupling-up of gas-engines, or (when the reliable type comes) gas-turbines, to dynamos. Whether the changed circumstances of the sulphate of ammonia market will damp the ardour of our friends, and induce them to adhere to steam for a period until we know more precisely the prospect of things in connection with sulphate of ammonia, we cannot say. Accrington has led the way in the application of the gas-producer and bye-product recovery to the generation of electricity. But although Accrington, considering the nature of its load, has hitherto done well, there is a noticeably decided hesitation to follow the example; and there is a tendency to think that the proper place for the carbonization of coal and the dealing in residuals is at one large centre—the gas-works, with clean gas supplied to the town electricity generating station for use in high-efficiency gas-engines for the production of current. Several electrical engineers are already looking in this direction; and there is no reason why they should not be encouraged to do so—more particularly when we remember that Sir Alexander Kennedy last March stated that the costs of an electric supply undertaking are divided practically into three parts—25 per cent. of the whole is the cost of generation, 25 per cent. the cost of distribution, management, rates and taxes, insurance, and so on, and the other 50 per cent. is capital charges. Therefore 75 per cent. of the costs of electricity supply is attributable to purposes other than generation; and so the advantage in supplying a cheap, clean, and good fuel for generating purposes would not materially affect the competitive position so far as the gas industry is concerned.

Causes of Electricity Adoption in Gas-Works.

The large introduction of electricity into gas-works operations is due to the modern charging and discharging machinery for retort-houses in which horizontal retorts are used, and which method of carbonization has still the largest vogue, and the largest number of professional adherents. The old types of retort-house machinery were worked by compressed air, hydraulic power, or flexible rope drive; but these are fast being displaced—the propelling of the machines along the retort-house floor, the raising or lowering of the operative parts to the different vertical heights of the retorts, the operating of the projector or the pusher, or the coal-containing chain of the combined charger-discharger, are now commonly being done by electricity, without the displacement of gas. The convenience of electrical energy for such work as this—the convenience of being able to collect energy at any point by the simplest and most effective method of the overhead trolley wire—has, through the necessity of obtaining a sufficient load for the generating plant, led to its adoption for other mechanical operations on gas-works—notably for driving coal and coke handling plant. Here, again, the provision of electrical power has had much to do with the ready and popular application of the telpherage system of coal and coke handling which most—some more than others—of our gas-plant contractors have done so much to develop and perfect for gas-works purposes, as articles in our columns have shown. Some of these firms are of opinion that the telpher has been largely instrumental in causing the adoption of electrical power in gas-works; but the dominating cause has unquestionably been the adoption of the coal-projectors of various types—such as the De Brouwer and Robert Dempster and Sons', the Fiddes-Aldridge combined charger-discharger, and the West charger and pusher on one base. In fact, from the lists before us, it is definitely shown that these machines were more responsible than anything else for the original adoption of electricity on gas-works. On its installation, it was at once apparent that it would be more economical to adopt motor drives to coal-breakers, elevators, &c.—it being only necessary to provide a length of cable so as to connect-up the motors at any position. The transition to the overhead electric telpher for the transport of coal and the distribution of coke from the retort-houses was an easy matter. The development, too, of the vertical retort processes—in the order of their commercial exploitation, the Dessau, the Woodall-Duckham, the Glover-West, the Dempster, and the Wilson (or Glasgow) systems—has seen the application of the electric-motor as the most convenient method of providing power for the mechanical portions of the plant. In many cases, the existence of an electricity generating plant enables

other plant to be readily installed, about the adoption of which there might otherwise be some hesitation.

GENERATING PLANT, INSTALLATIONS, CAPACITY, AND VOLTAGE.

All gas-works contractors now undertake to supply with their retort-charging machines, vertical retort installations, or telpher plants, the necessary electricity generating plant, either to an engineer's own specification, or in accordance with their own standard plans to meet the work to be done. Generally speaking, the generating plants vary in capacity from 20 to 100 KW. In the majority of cases the voltage is 220; but voltages of 110, 450, and 500 are also used. In the appended list of gas-works now using electricity, most of them have their own generating plants; but in certain towns—for instance, Blackburn, Burton-on-Trent, Darwen, Hamilton, and Leicester—the current is taken from the town cables, and, as already mentioned, a few of the plants (instead of being in duplicate) use the local supply as a stand-by. In the compilation of the following list of works using electricity for driving plant of various kinds, we have been largely assisted by Messrs. W. J. Jenkins and Co., Limited, and Messrs. Aldridge and Ranken; and contribution has also been made by the well-known makers of vertical retort plants and telpher plants. If the list is not complete, or if any errors have crept into it, we shall be glad to have correction from our friends.

List of British Gas Undertakings Using Electricity for Charging and Discharging Machinery and Other Plant.

Aldershot
Alloa
Altrincham
Ashton-under-Lyne
Banbury
Barking
Barnet
Barnsley
Belfast
Bilston
Bingley
Birkenhead
Birmingham—
  Adderley Street
  Nechells
  Saltley
  Windsor Street
Bishop Auckland
Blackburn
Blackpool
Bolton
Bournemouth
Bradford
Bristol
Broadstairs
Burnley
Burton-on-Trent
Bury (Lancs.)
Cambridge
Cardiff
Castleford and Whitwood
Commercial Gas Company
Cork
Coventry
Croydon
Darlington
Darwen
Derby
Doncaster
Douglas
Dublin
Dumfries
Dundee
East Hull
Eastbourne
Falkirk
Farnworth
Gas Light and Coke Company
Great Harwood
Greenock
Grimsby
Guildford
Hamilton
Harrow
Hastings
Hull (British Gas Company)
Ilkley
Ipswich
Keighley
Kettering
Kidderminster
Kingston-on-Thames
Lancaster
Langley Mill
Lea Bridge
Leamington
Leeds
Leicester
Lincoln
Liverpool
Long Eaton
Longwood
Loughborough
Maidstone
Manchester
Merthyr
Mirfield
Neath
Nelson
Newcastle-on-Tyne
Newport (Mon.)
North Middlesex Gas Company
Norwich
Nottingham
Nuneaton
Ormskirk
Otley
Paisley
Perth
Peterborough
Plymouth
Portsmouth
Preston
Pudsey
Reading
Rochester
Salford
Skipton
Smethwick
South Shields
South Suburban Company
Southampton
Southend
Stirling
Stockport
Stockton-on-Tees
Stretford
Sunderland
Sutton (Surrey)
Tonbridge
Tottenham
Tunbridge Wells
Uddingston
Uxbridge
Wallasey
Walsall
Wandsworth
Watford
West Bromwich
Weston-super-Mare
Weymouth
Whitehaven
Widnes
Wrexham
Yeadon

It may be mentioned, by the way, that the Hammersmith Borough Council use a De Brouwer projector for storing coal in bulk at their electricity station.

A FEW EXAMPLES FROM ABROAD.

Messrs. W. J. Jenkins and Co., Limited, inform us that, in connection with their plant erected abroad, the following gas-works use the electric drive: Auckland (N.Z.), Baltimore (U.S.A.), Bergen (Norway), Calcutta, Christchurch (N.Z.), Dunedin (N.Z.), Kobe (Japan), Melbourne, Montreal, Osaka (Japan), Primitiva (S.A.), River Plate (S.A.), South Australian Company (Adelaide), North Shore Gas Company (Sydney), and Tokyo (Japan).

Messrs. Aldridge and Ranken, who have supplied several of the Fiddes-Aldridge machines to gas-works abroad, have also put in a complete electricity generating plant at the Valparaiso Gas-Works.

DETAILS OF REPRESENTATIVE ELECTRICAL INSTALLATIONS.

It would be a big task to describe in detail all the generating plants at the various gas-works; but Mr. Ranken, of the last-named firm, has kindly compiled for this article the following particulars of a few representative installations:

ALDERSHOT—Two "Browett-Lindley" engines, two "E. C. C." generators, 36 kw., 225 volts, 450 r.p.m.

BANBURY—One National engine, one "E. C. C." dynamo, 50 amp., 225 volts, 250 r.p.m.

BIRMINGHAM (ADDERLEY STREET)—One Crossley "U. E." engine, coupled direct to "E. C. C" dynamo, 160 amp., 225 volts, 220 r.p.m.

COVENTRY—Two Crossley "X. E." engines, coupled direct to Siemens shunt-wound generators, 204 and 220 volts, 210 r.p.m.

GUILDFORD—Two Crossley engines "S. E.," coupled direct to "E. C. C." dynamos, 100 amp., 225 volts, 250 r.p.m.

KETTERING—One National "T. E." engine, "E. C. C." dynamo, 28 kw., 225 volts, 240 r.p.m.

LEICESTER—Corporation supply alternating current, 220 volts, 50 cycles single phase. Two "E. C. C." motor generators, 15 kw. direct current, 225 volts, 950 r.p.m.

MERTHYR TYDFIL—One National gas-engine, direct coupled to "E. C. C." dynamo, 75 amp., 225 volts, 250 r.p.m.

NEWPORT, MON. (CRINDAU GAS-WORKS)—Fielding and Platt gas-engine, driving direct "Lancashire" dynamo (compound wound), 114 amp., 220 volts, 225 r.p.m.

ORMSKIRK—One National "S. E." engine. "E. C. C." dynamo, 70 amp., 225 volts, 250 r.p.m.

PETERBOROUGH—National gas-engine. Mather and Platt dynamo, 80 and 250 volts. National "S. E." type, coupled direct to "E. C. C." series wound dynamo, 15·75 kw., 250 volts, 250 r.p.m.

PORTSEA ISLAND GASLIGHT COMPANY (HILSEA WORKS)—Two "P. E." Crossley engines and two "E. C. C." dynamos, 50 amp., 225 volts, 250 r.p.m.

ROCHESTER—Two "P. E." Crossley engines, and two "E. C. C." dynamos, 50 amp., 225 volts, 250 r.p.m.

SOUTHAMPTON—One National engine "X A.E.," "E. C. C." dynamo, 50 kw., 222 amp., 225 volts, 210 r.p.m.

SOUTHEND—Crossley "X. E." engine, coupled direct to Siemens compound wound dynamo, 160 amp., 225 volts, 210 r.p.m.

TUNBRIDGE WELLS—One National engine, one National generator, 70 amp., 225 volts, 250 r.p.m.

VALPARAISO—One Crossley "X. E." engine, coupled direct to Siemens compound dynamo, 41 kw., 75 amp., 550 volts, 210 r.p.m.

WEYMOUTH—One National "S. E." engine and "E. C. C." dynamo, 70 amp., 225 volts, 250 r.p.m.

WIDNES—Two 95 B.H P. gas-engines, 210 r.p.m., and dynamos, 50 kw., 225 volts.

WREXHAM—Crossley "R. E." engine, coupled direct to Siemens shunt-wound generator, 15·5 kw., 70 amp., 220 volts, 250 r.p.m.

MOTORS USED ON GAS-WORKS—PARTICULARS OF FURTHER PLANT AND MOTORS.

Most of the motors used in connection with gas-works plant are of the types supplied by the Lancashire Dynamo and Motor Company, Limited, or Electromotors Limited. The motors used are of the totally enclosed dust-proof type. The first-named Company have also made for the purpose of this article the following compilation of particulars of representative plant and motors that they have supplied (in all cases but two) for plant installed by Messrs. Jenkins and Co.:

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY—Three generating sets, each consisting of National gas-engine, direct coupled to Lancashire dynamo. Each set develops 60 kw., 200 r.p.m. Also nineteen motors of 300 H.P. total, and ranging in size between 4 H.P. and 45 H.P. The motors drive coal-conveyors, coal-breakers, retort-chargers, elevators, coke-conveyors, and coal-store cranes.

BRISTOL GAS COMPANY—Two complete generating sets, each consisting of National gas-engine, direct coupled to Lancashire dynamo, through a flexible coupling. Each set develops 220 volts, 230 amp., at 200 r.p.m. Switchboard also supplied, together with the following motors: Elevator and conveyor, 12 H.P.; coal-breaker, 15 H.P.; coke-conveyors, 3·5 H.P.; retort charger, 4 H.P.; elevators and conveyors, 2·7 H.P.; also five other motors of 37 H.P. total.

BURY CORPORATION—Belt-driven generator to develop 12 kw., at 800 r.p.m. This supplies current to the retort-charging machine, which has three motors: Charger, 6 H.P., at 750-1500 r.p.m.; traveller, 6¾ H.P., 520 r.p.m.; discharger, 7½ H.P., 310 r.p.m.

CROYDON GAS COMPANY—One Lancashire automatic reversible booster set to develop 200 amp. (one hour), 40 volts; also one 60 kw., 200 r.p.m. dynamo; and two motors of 20 H.P. total.

DERBY GASLIGHT COMPANY—One 27 kw., 230 r.p.m. dynamo; two 20 kw., 750 r.p.m. dynamos; also fifteen motors of 100 H.P. total.

DONCASTER.—One 20 kw. dynamo and motors for retort charging: Charger, 6 H P., 750-1500 r.p.m.; feeder on machine, ¾ H.P.; discharger, 7½ H.P., 310 r.p.m.; traveller, 7½ H.P., 310 r.p.m.; and conveyor, 7½ H.P., 310 r.p.m.

IPSWICH—One 9 kw., 700 r.p.m., belt-driven dynamo; one 27 kw. dynamo, and one 45 kw.; with motors of 90 H.P. total, and ranging in size between 6 and 17 H.P.

LEAMINGTON—Two 25 kw. generators; and ten motors, totalling 72 H.P., and ranging from 4 to 14 H.P.

MIRFIELD GAS COMPANY—One 9 kw., 700 r p.m., belt-driven dynamo and four motors for retort-charger: Charger, 4 H.P., 750-1500 r.p.m.; traveller, 7½ H.P., 310 r.p.m.; discharger, 7½ H.P., 310 r.p.m.; and conveyor, 11 H.P., 350 r.p.m.

NEATH—One 9 kw., 250 r.p.m., dynamo and four motors for retort charging: Charger, 3 H.P., 900-1500 r.p.m.; traveller, 7½ H.P., 310 r.p.m.; discharger, 7½ H.P., 310 r.p.m.; and conveyor, 9 H.P., 475 r.p.m.

STOCKPORT CORPORATION—Eight motors, each 12 H.P., for conveyors; also one 15 H.P., 440-850 r.p.m., motor.

WAPPING (COMMERCIAL GAS COMPANY)—One 20 kw., 570 r.p.m., dynamo, and four motors for retort charging: Charger, 4 H.P., 750-1500 r.p.m.; traveller, 11 H.P., 350 r.p.m.; discharger, 11 H.P., 350 r.p.m.; and conveyor, 13 H.P., 470 r.p.m.

WEST BROMWICH—One 20 kw. dynamo, 230 r.p.m.; and three motors of 31 H.P. total, and 2½ to 16½ H.P. in size.

TEST FIGURES FROM ACTUAL WORKING OF A RETORT-CHARGER.

The Lancashire Company also supply the following results of a test on an electrically-driven retort-charger. The test was carried out on twelve beds of eight retorts; but the following tests were taken with only eight beds in use. The machine charges sixteen retorts every two hours, each with 10 cwt. of Arley slack, and also discharges about 5 cwt. of spent coke from each retort.

Motor on Charger.

Average current per round of retorts . . 16 amp.
Maximum current . . . . . 35 amp.
The actual load on the motor averages 3·7 H.P. for 18 minutes each two hours throughout the day.
The load factor works out at 0·068.

Motor on Traveller.

Average current per round of retorts . . 14 amp.
Maximum current . . . . . 50 amp.
The actual load averages 2·9 H.P. for 45 minutes each two hours throughout the day.
The load factor works out at 0·102.

Motor on Discharger.

Average current per round of retorts . . 8 amp.
Maximum current . . . . . 36 amp.
The actual load is 1·6 H.P. for 25 minutes each two hours throughout the day.
The load factor works out at 0·042.

Motor on Conveyor.

Average current per round of retorts . . 20·5 amp.
Maximum current . . . . . 33 amp.
The actual load is 4·8 H.P. for 19·5 minutes each two hours throughout the day.
The load factor works out at 0·1.

Dynamo Supplying Power to Above.

Average current per round of retorts . . 16 amp.
Maximum current . . . . . 68 amp.
The actual load averages 3·5 kw. for 59 minutes each two hours throughout the day.
The load factor works out at 0·116.

These are interesting test figures on an electric driven retort-charger in actual practice. It will be noted that the load factor is very low; and for this reason it is a great advantage to fit a battery and automatic reversible booster, as has been done at Croydon and Huelva. This enables a small generator to be used economically, and the peak loads are dealt with automatically by the booster and battery.

ELECTRIC MOTORS ON VERTICAL RETORT INSTALLATIONS.

Electromotors Limited make the following selection of typical examples of the installation of their dynamos and motors in connection with vertical retort installations:

BELFAST—Four 6½-H.P. motors, 540 r.p.m., two 12-H.P., 880 r.p.m., two 30-H.P., 525 r.p.m., and two 9½-H.P., 510 r.p.m.

BERGEN—One 5½-H.P. motor.

BRISBANE—One 24-H.P., 560 r.p.m., one 6-H.P., 720 r.p.m., one 9-H.P., 900 r.p.m., and one 6-H.P., 780 r.p.m.

BURNLEY—One dynamo, one 7-H.P. motor, 650 r.p.m., and one 15-H.P. motor, 600 r.p.m.

CARDIFF—One 25-H.P., 600 r.p.m., two 8-H.P., 600 r.p.m., one 12-H.P., 600 r.p.m., one 6-H.P., 600 r.p.m., and one 9-H.P., 900 r.p.m.

DOUGLAS—50 kw. dynamo, two 12-H.P. motors, 550 r.p.m., and one 7½-H.P. motor, 560 r.p.m.

LEICESTER—Two 30-H.P., 600 r.p.m., one 10-H.P., 830 r.p.m., one 8-H.P., 620 r.p.m, one 10-H.P., 650 r.p.m., and two 8-H.P., 620 r.p.m.

MANCHESTER—Two 24-H.P., 670 r.p.m., two 11-H.P., 600 r.p.m., two 5-H.P., 600 r.p.m., two 9-H.P., 520 r.p.m., and four 7-H.P., 510 r.p.m.

NELSON—One 6½-H.P. motor, one 17-H.P. motor, one 5-H.P motor, and one 11-H.P. motor.

NEWCASTLE (AUSTRALIA)—One 11-H.P., 800 r.p.m., one 20-H.P., 600 r.p.m., two 5-H.P., 450 r.p.m., one 5-H.P., 770 r.p.m., and one 7-H.P., 450 r.p.m.

NEWCASTLE-UPON-TYNE—Two 25-H.P., two 9-H.P., two 4-H.P., and two 8-H.P.

SOUTHPORT—One K2 motor.

All motors in the foregoing list (typical only) are used in connection with Glover-West vertical retorts, except those supplied for Douglas and Burnley. At Douglas, the motors are driving coke-handling plant, and at Burnley a coal-handling plant; and it will be noticed that in connection with these two installations dynamos were also provided. The motor supplied for the Glover-West retort installations is a special type, proof against coal dust, and suitable for the arduous conditions and rough handling to which motors of this class are subjected. The machine is entirely enclosed. The large side doors with sunk handles have rubber gaskets; and, when removed, give ample access to the machine—a feature which is rarely found in fully enclosed machines of this description. The terminal box is cast solid with the end shield, and has a packed screw-down lid, while the entrance for the cables is screwed to receive steel tubing. The bearings are to British Admiralty design, having good stiff shafts with phosphor bronze bushes, and two oil-rings to each bearing; so that, in the event of one ring by any chance becoming stuck, the other still lubricates. The lids of these bearings are also packed and screwed down by means of thumb-screws.

In the case of the Woodall-Duckham retort installations, the instances where electrical plant has been installed by the Company are included in the long list of towns given in an earlier part of this article.

USEFUL AND DEFICIENT INFORMATION.

The particulars given in this article show how largely, through the special work that is provided by gas-manufacturing plant, electricity has entered into the operations; it also gives information as to the power required in connection with various parts of the plant. The particulars of test-results supplied by the Lancashire Dynamo and Motor Company are useful in this regard. There is some deficiency in connection with references to plant in other parts of the article, which is that there is a want of information as to the amount, or rather the maximum amount, of work that the plants are called upon to perform. In some cases, reference to descriptive articles in the "JOURNAL" will assist in the making of an approximate calculation.

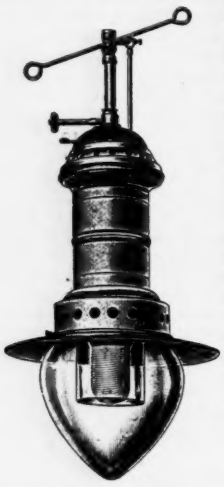
American Gas Institute and Refractory Materials.

The current number of the "American Gas Institute News" contains a report of a joint meeting of the Committee on Refractory Materials of the Institute and a Committee of the Refractories Manufacturers' Association, held in Chicago last month, at which evidence was furnished that the subject of refractory materials is receiving considerable attention in America. The first matter taken up was the bibliography which has been prepared by Messrs. Morton and Saunders, of the United Gas Improvement Company's staff, under the direction of Mr. W. H. Fulweiler. This work is stated to be unique, in that it is an abstract bibliography—that is to say, each reference is followed by a concise abstract of the reference. This bibliography will be carefully indexed, and will be submitted as part of the report of the Committee. The question of the publication of the bibliography was discussed; and it was suggested that the report of the Committee, together with the bibliography, should be published by the Institute, and sold at a nominal sum to those interested. The next matter taken up was the discussion of the information which is being obtained regarding the temperatures and load conditions to which refractory material is subjected in the various types of carbonization plants throughout America. Much valuable information has already been received, and the Committee decided to compile it in tabular form and submit it as part of their annual report. It was also decided to obtain further information regarding the temperatures and loads.

Rusting of Iron in Water.—Many years ago, Mr. Crace Calvert concluded that the rusting of iron in water was occasioned by dissolved carbonic acid and oxygen; the former being the predisposing cause, since no action occurred in its absence. These conclusions have since been widely supported. Experiments conducted by Mr. W. A. Bradbury, and described by him in the "Chemical News," show that rusting takes place very rapidly in tap water, while in well-boiled tap water no rusting should occur. During rusting atmospheric oxygen is absorbed. The solution of iron by carbonic acid should result in the production of hydrogen, thus: $Fe + 2H_2CO_3 = FeH_2(CO_3)_2 + H_2$; but in experiments with tap water no gas could be collected after more than a week. Water saturated with carbonic acid did evolve considerable quantities of gas. These experiments confirm the view that rusting is due to the combined action of oxygen and carbonic acid, and show that the oxygen is utilized in two ways—in the oxidation (*a*) of the nascent hydrogen liberated, and (*b*) of the iron bicarbonate to rust.

NEW LAMPS AND BRITISH GLASSWARE.

Some few weeks ago—to be precise, on Sept. 22—there was given in the "Journal" a description of a new inverted burner, called the "1915 Glasmi-China," which is being introduced by Messrs. J. & W. B. Smith, of Farringdon Road, E.C. An examination now of the freshly issued supplement to the firm's general catalogue of gas-fittings, shows that this burner is not the only new "all British made" gas lighting appliance which finds mention there. For example, the new improved "Briton" inverted burner has been followed up by an indoor 300-candle high-power low-pressure lamp, to which the name of "Briton" has also been applied. This lamp, which, as the accompanying illustration shows, is neat and graceful in appearance, and so eminently suitable for interior illumination, is designed for a gas consumption of about 7½ cubic feet per hour. It is white enamelled, with gold lines. Then, to mention another instance, there is the "Alliance" regenerative burner, which is made with the case and reflector in one piece. This is a light which is specially suitable for lobbies, open shops, arcades, verandahs, and similar positions; and it is finished in serviceable green enamel. It can be purchased with or without bye-pass. Many other types of lighting appliances—all British made—are illustrated, including, of course, various patterns of the well-known "Silva" lamps.



The "Briton" Indoor Lamp.

On the subject of glassware a word or two may be said, as this is a matter which is at the present moment exciting particular interest in this country. Messrs. J. & W. B. Smith have, as those who happen to do business with them are well aware, long been connected with the British glass trade; and their plant in Farringdon Road for the decoration of globes by acid etching and brilliant cutting and the obscuring of them by sand-blasting, as well as for carrying out numberless other operations in glasswork, has more than once been referred to in these pages. The cutting-off of supplies of the cheaper forms of glassware which it has hitherto been the custom to obtain from Germany and Austria, is, however, now giving rise to efforts among British manufacturers (who have hitherto devoted themselves to the more expensive classes of goods) to supply the shortage thus created. Messrs. J. & W. B. Smith, being determined to keep themselves well abreast of the latest developments of the business in which they have so large an interest, have made a move in this direction. They announce that they have made arrangements for the re-starting of a glass-works in the Black Country, with nine or ten furnaces, to carry on the manufacture of those lines for which the wholesale houses, in more peaceful times, relied upon Germany and Austria. We hope that they will thus succeed in establishing not merely a temporary but a permanent new branch of business.

CANNON GAS-FIRES.

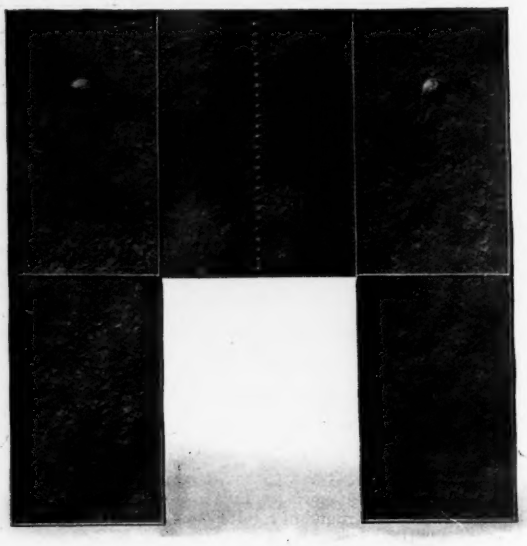
There is nothing surprising in the fact that attention should be drawn on the front page of the new season's gas-fire list of the Cannon Iron Foundries, Limited, of Deepfields, near Bilston, to their claim that they were "first in 1906 for radiant efficiency in official 'Smoke Abatement' tests," and "first in 1914 for hygienic efficiency in official 'Lancet' tests." These statements demand consideration for the wares which the Company have to offer; and it must be noted that all the fires described and illustrated in the list are constructed to pass the "Lancet" hygienic efficiency tests.

With regard to bricks, fuel, and general fittings, all the patterns are interchangeable one with another of corresponding size, so as to facilitate the stocking of parts. The gas and air regulator fitted is designed to produce good aëration of the gas and a smokeless flame; and right-hand or left-hand connections can be made at will. The fires are, of course, of patterns and sizes to suit varying requirements; and they can be had in many different rich colourings, enamelled with the firm's non-poisonous, leadless "Vitrolustre" glaze. The "Primrose" nursery fire, with boiling-burner on top, is now made with an 8-inch, as well as a 6-inch, fire-opening; and in this size there should be a further demand for the fire. More extensive requirements in the way of an interior for converting an ordinary coal-grate into a modern gas-fire, are met by an extra-large size of the "Poppy" series—that is, with a 16-inch fire-front, which is an addition to the 12-inch and 14-inch sizes previously supplied.

The Cannon Iron Foundries also illustrate a good selection of radiators; and they supply, too, a patent cast-iron burner, for fitting into ordinary coal-grates—pointing out fairly, at the same time, that no grate-burner is as economical in regard to consumption of gas as a proper gas-fire.

AN ADJUSTABLE GAS-FIRE FILLING.

Many persons, on looking at the metal sheet behind their gas-stove which fills up the top and sides of the fireplace opening, must have wished that they could have, instead, something which would be a little more attractive in appearance, and which would at the same time not add appreciably to the cost. Something, that is, between the plain black sheet and the handsome tilings which are deservedly so fashionable. Everyone will admit the great extent to which a wisely-chosen filling of tiles enhances the appearance of a well-designed gas-fire—though we will not go so far as to say that the filling round a gas-fire is as important as is the frame to a picture, because very often the frame is much better than the picture, and no one would like it to be thought that this could be the case with a gas-fire. This, however, is by the way. It is a fact that a gas-fire surrounded by a plain black sheet is not seen at its best, and it is also a fact that a quite inexpensive and simple means, apart from tiling, is available for greatly improving its look.



Art Metal Backing for Fires.

What is referred to is an adjustable art-metal filling introduced by Burners Limited, of No. 42, Ingleby Street, Birmingham. Its price places it within reach of anybody who uses a gas-fire, while so far from causing trouble in fixing, it actually saves work, inasmuch as within a very wide range of sizes of mantel openings it is placed in position without any cutting at all. There are five sheets, and a bottom stay, and with each set are sent out the necessary bolts and nuts. All, therefore, that is necessary to be done—except, maybe, in the case of very large fires, or exceptionally small mantel openings—is to punch holes where measurements indicate that the bolts require to be fixed. This punching is easily accomplished, and the explicit instructions forwarded with the sheets should obviate the possibility of wrongly placing the holes.

That the filling is worthy of finding a position alongside tasteful furniture and efficient gas-fires is evident from an inspection of it; and there should be an "opening" for the arrangement in more senses than one. The sheets can, of course, be finished in any colour, but it is intended to stock them in oxidized copper and armour bright. Later on the firm promise a more elaborate style of filling provided with a canopy.

The late Mr. Walter Hunter, whose death was recorded in the "Journal" for the 15th ult., left estate of the gross value of £38,075. Among the bequests is a sum of £100 to the Benevolent Fund of the Institution of Civil Engineers.

Gas Purification with Recovery of Bye-Products.—According to a French patent taken out by Herr Berkheiser, an abstract of the specification for which appears in the "Journal of the Society of Chemical Industry," hydrogen sulphide is absorbed by an alkaline emulsion of hydrated iron oxide and free sulphur. The mixture of iron sulphides and free sulphur formed is treated with an alkali sulphide to extract the free sulphur, and the iron sulphides are oxidized so as to regenerate an emulsion of hydrated oxide and free sulphur. The alkali necessary for the absorption may be provided by the ammonia present in the crude gas; the temperature of the washing liquor being regulated so as to leave the requisite quantity of ammonia in the gas. The cyanogen in the crude gas is also absorbed, soluble thiocyanates being formed. The solution from the extraction with alkali sulphide is heated to from 90° to 100° C. to precipitate free sulphur, the thiocyanates remaining in solution. The hydrogen sulphide and ammonia set free by heating the solution are returned to the purifier. The free sulphur is burnt, and the sulphur dioxide used for absorbing ammonia from the coal gas.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The opening meeting of the session of the Scottish Junior Gas Association (Eastern District) was held in the Heriot-Watt College, Edinburgh, last Saturday. Mr. WILLIAM GEDDES, the retiring President, occupied the chair; and there was a good attendance.

Mr. GEDDES said the Association were beginning the new session under somewhat solemn conditions, in respect of the war. They heard at the present time a great deal about loyalty to the Empire and loyalty to those in authority; and he appealed to the members, when the programme for the current session had to be considerably curtailed, to keep alive their loyalty to their Association. They wished to cement the bonds of friendship and of interest in a common object, and he hoped each individual member would find it to be his duty to turn up at the meetings. He concluded by moving as his successor in the chair Mr. R. B. Chalmers, of North Berwick, who required no introduction from him, and who, he was sure, would carry out the duties of the office to the satisfaction of all.

Mr. CHALMERS, on taking the chair, returned thanks for his election. His first duty was to present to the retiring President the usual medal. They all knew that for some years past the Association had spent two or three pounds for a medal to the retiring President. Last year it had been decided that less money should be paid for the medal, and more given for prizes for the best papers. Although this medal was of less value than those for previous years, it would still convey to Mr. Geddes the best wishes of the Association.

Mr. GEDDES, in returning thanks, said the intrinsic value of the medal was not so important as the fact that it would be the means of his cherishing memories of happy times he had spent as President among the members of the Association.

The PRESIDENT said the various papers that had been read last session had been handed to Mr. Masterton, the Engineer to the Edinburgh and Leith Corporation Gas Commissioners, as judge. His report showed that the papers read by Mr. Doran and Mr. Mackay were of equal value. The Council had, therefore, decided to divide the prize equally, and to add something to the value of each. He then presented vouchers to Messrs. Doran and Mackay for the value of books which they would be allowed to choose later. The Council had not yet received intimation of communications for the new session; and he asked members to come forward and offer to read papers.

PRESIDENTIAL ADDRESS.

The PRESIDENT, continuing, said it had been the custom for the President to give an address at the opening of the session. He had not prepared a written address, but he wanted to talk as a junior to juniors about various things with which he had come into contact in the course of his duties at North Berwick, in the hope that his remarks might be of value to those present. If he made any mistakes in what he told them, they could discuss the subject after he had finished. He then proceeded to discuss, by means of illustrations on the black board, the proper size of pipes, the drying of steam, a new coke-quencher which had been introduced in the North Berwick Gas-Works, the proper lubrication of exhausters, and other matters. In connection with steam-valves, he said that he always advocated putting in soft-faced valves, which it took just a matter of a few minutes to undo. He handed round a number of printed tables which were used at North Berwick in connection with the surveying of meters and for other purposes. He concluded by relating some amusing experiences he had had in connection with the inspection of gas-fittings and the fitting in of gas-fires.

A PAPER ON EXHAUSTERS.

Mr. C. H. KRAUSHAAR, of Manchester, then read a paper on "Exhausters." This will be found on p. 130.

VOTES OF THANKS.

The PRESIDENT said he was sure the members had enjoyed Mr. Kraushaar's paper very much. It was good of him to come all the way from Manchester to give them such an excellent paper. There was no doubt that the Turbo exhauster described by Mr. Kraushaar would be the exhauster of the future in large works. This type of machine would give a far more steady vacuum pressure than the usual rotary type in use. He moved a hearty vote of thanks to the lecturer.

On the motion of Mr. J. J. SCOTT, of Kennoway, the President was thanked for his conduct in the chair; and the meeting ended.

The Second Hawksley Lecture.—It is announced in the "Journal of the Institution of Mechanical Engineers" for the current month that the second Thomas Hawksley lecture will be delivered in the hall of the Institution on the evening of the 30th inst., by Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Metropolitan Water Board, who has chosen for his subject "Pumping and Other Machinery for Water-Works and Drainage." After referring to the late Thomas Hawksley's early works at Nottingham, Mr. Bryan will trace the evolution of the water-works pumping-engine from the beginning of the last century. The lecture will be illustrated by lantern slides.

THE LATEST IN HOME GAS LIGHTING.

A Lecture by Walter T. Dunn.

The Friday evening informal meetings of the Junior Institution of Engineers enjoy a popularity among the members that is thoroughly well deserved. Subjects of various kinds are presented and discussed in a chatty way amid comfortable surroundings; and ample opportunity is presented for that social intercourse which is of such great importance in connection with organizations of this character. One of these informal gatherings took place last Friday evening, and at it Mr. Walter T. Dunn (the Secretary of the Institution of Gas Engineers) delivered what was termed a "lecturette," but was in reality quite a first-class lecture, on "The Latest in Home Gas Lighting." For the occasion, the meeting-place had been converted into an up-to-date gas showroom; Mr. Dunn having got together, with the aid of some kind friends well able to assist him, an excellent array of modern gas-fittings and glassware. The value of the display, too, was much enhanced by the fact that a number of burners were shown in action. Then there were, in addition, many lantern slides thrown on the screen, which were greatly appreciated by the audience. Altogether the evening was a highly instructive one; and the author must have felt himself well repaid for the trouble he had taken in the preparation of the "fare." The chair was occupied by Mr. Reginald Marshall, who, in opening the proceedings, made cordial acknowledgment of the great pains to which Mr. Dunn had put himself in order to give them all an interesting evening.

THE HOME AND ITS LIGHTING.

The subject with which the lecture dealt is, of course, one of first importance—a fact which Mr. Dunn clearly demonstrated when, by way of preface, he devoted a few minutes to considering the home in its broader aspect, and to pointing out the necessity for making it as beautiful and comfortable as possible. Mankind, he said, showed a supreme pride in the place he called home, however humble it might be. It contained his most cherished treasures, and was his sanctuary from the pressing and harassing engagements of his everyday life. It was therefore only natural that, according to his circumstances in life, man should make his home conform to the conditions he conceived would best conduce to the comfort, pleasure, and satisfaction of himself and all who dwelt there. To a very considerable extent his home would give expression to his character.

Merely a casual contrast of the home of the artizan of to-day with that of but a few years ago would demonstrate the fact that his tastes were happily developing under the influence of an enlarged education, popular editions of the best writers, and facilities for the inspection of works of science and art in this country and abroad, under competent guidance. He was thus led into the enjoyment derived from a knowledge of the classics in these departments of human effort. He learned to admire and revere them, and so desired to obey their silent but eloquent behests, which, in effect, bade him think, say, and do only those things that were beautiful, in all relationships of life. Indeed, all sorts and conditions of men and women were influenced in a greater or less degree by these circumstances; and their homes, as he had already remarked, would be a reflex of the effect they had had upon them. There must be considered, too, the effect upon their children—unconsciously, but surely, learning to discriminate between the ugly in thought, in word, and in deed, and that which was truly admirable. Home, then, was a place which they wished to make as beautiful as possible.

ELEGANCE.

Much thought was given to the selection of furniture and of general fittings, but not until recent years had the question of effective lighting been taken seriously into account. It must not be forgotten that considerations of health were largely involved when home lighting was under discussion. Elegance, efficiency, and economy he proposed to take as the three guiding principles in considering what was best for the gas lighting of homes; and he had placed them in what he believed was their order of importance. The ideal light being daylight, it should be the aim in artificial illumination to imitate it as nearly as possible. They should not in their homes have intense points of light visible to hurt the eyes of their friends and render difficult a full conception of the surrounding objects.

Fortunately, all the bearings of the questions of good and sensible illumination were being dealt with in a specialized way by the Illuminating Engineering Society. The very fact that this Society, which was called into being for the purpose, had been so successful, showed that problems of lighting did require well-considered investigation and sound judgment. Haphazard methods, it was hoped, would soon be quite a thing of the past, and light where needed, of a suitable candle power, and properly diffused, would be universal. A glance at the various fittings exhibited would show that elegance was being kept well in mind. A handsome leaded shade (lent by the Tottenham District Light, Heat, and Power Company), and various types of pendants, brackets, &c., all bore evidence of the beauty of the artists' designs, and of the ability of the operative to materialize them for practical use.

EFFICIENCY.

Coming to the second point—efficiency, Mr. Dunn remarked that here questions of candle power naturally arose. In this

connection, he showed a "Holophane Lumeter," lent to him by Mr. Mackinney, and drew attention to a number of "Holophane" reflectors. He then quoted the following rules for good lighting which have recently been published by the Holophane Company, as the result of scientific investigation.

"Holophane" Rules for Good Lighting.

There must be sufficient generated light so that objects are easily seen by means of the light which they reflect: Therefore more light must be thrown on dark objects than on light.

There must not be too much illumination, or the brightness of objects will tire the eye.

Exceedingly bright lights in the field of vision should be avoided—that is, the intrinsic brilliancy of the light-sources should be low, or the units placed out of the direct field of view.

Streaks or striations in the resulting illumination are undesirable, owing to the attempt of the eye muscles to adapt themselves to the varying illumination. Highly-polished reflectors which give definite images of the light-sources are, therefore, to be avoided, or used only with lamps provided with diffusing and enclosing globes.

Light-sources should be properly placed so that the light is not regularly reflected into the eye. This is particularly applicable to desk lighting and similar employments; and in conjunction with the striation effects mentioned above, this has been the cause probably of more eye trouble than any other one thing, with the exception of unshaded lamps of high intrinsic brilliancy in the field of vision.

Some forms of globes and reflectors are intended to diffuse the light evenly in all directions; others concentrate the light mainly in one particular direction. Care, therefore, should be taken that the kind of shade which the local conditions demand is used. Avoid very shallow reflectors such as only cover part of the lamp.

Diagrams were then thrown on the screen giving the light obtained with different burners, shades, and reflectors, and a slide showing the appearance of various conditions of a light-source against a white background and one of a black nature. This latter rendered it obvious that the relation of the light-sources to the colour and nature of the surroundings may make or destroy the artistic features. The illustration also emphasized the value of diffusing globes. Reference was next made to the "Telephos" gas-switch, the mechanism of the latest type of which was, by the aid of diagrams and samples, described at some length. There are, it was pointed out, embodied in this several important improvements. The whole apparatus is accessible by simply lifting a cover; the valve may be removed for cleaning without disturbing the burner; the working parts are outside the gas supply; and as the metal covers are made to harmonize with the fittings, the appliance is elegant in appearance. The "Pneumatic" distance lighter was dealt with similarly; examples of the apparatus being exhibited, among other forms, in connection with the South Metropolitan Gas Company's "Metro" burner. The author did not omit to allude as well to the pyrophoric method of igniting gas, of which considerable use has been made.

Due attention was, of course, given to the subject of ventilation; Mr. Dunn pointing out that lighting by gas is of the greatest value in securing perfect ventilation, as the heat given off causes an upward flow of the impure air, which, if rightly directed, passes away without doing harm. Illustrations of types of ventilating gas-lamps were shown, and their action explained.

As to the relative advantages of direct, semi-indirect, and indirect systems of lighting, the lecturer said the totally indirect plan had not been much used for home purposes, but the semi-indirect method had found approval in some places. The choice of any particular system of lighting in the home was, of course, largely a matter of taste. The efficiency of the various methods differed, especially in the cases of the indirect and semi-indirect systems, which depended so largely upon the co-efficient of reflection of ceiling and walls. In round numbers, the illuminating efficiencies of the three systems, assuming they were used under fairly favourable conditions, would be—

	Relative Illumination.
Direct	100
Semi-indirect	70
Indirect	50

These figures represented the amount of illumination that would be provided by equal consumption of energy.

It had been claimed that the lower efficiencies of the indirect systems were compensated for by the higher visual value of the illumination they provided. Some people had asserted that 2 foot-candles of indirect illumination were equal to 3 or 3½ foot-candles of direct illumination; but this, he remarked, had never been generally accepted. At least one committee who had had the matter under consideration had declined to favour the indirect system with this supposed advantage.

The lecturer expressed the view that it was probable that the frequent inadequate shading of direct lighting was largely responsible for the supposed advantage of indirect methods, and urged that those who provided the lighting agent should do everything possible, by educating the consumer, to secure the proper shading of the light-sources. It was, no doubt, a fact that the presence of a bare source of light irritated the eye, and by causing undue contraction of the pupil aperture seriously reduced the visual value. The remedy was simply a question of using either shades or obscuring globes.

Concluding his remarks on this portion of his subject, Mr. Dunn said that the question of the efficiency of the various methods was not of much importance in the home. The appearance or effect was the deciding factor. The choice, however, became important in industrial or shop lighting, where cost was a great consideration; and the fact that twice the quantity of energy that would suffice for direct lighting would have to be provided if indirect lighting were used (assuming equal illumination in each case), was a serious matter. Slides were then shown to give an idea of the action of the several kinds of "Holophane" prismatic glassware in re-directing the rays of light.

Economy.

On the subject of economy, Mr. Dunn said there was no doubt that gas for home lighting was an economical arrangement. This was borne out by the fact that it was used as the agent of light from the artizan's cottage to the mansion of the wealthy. Views were thrown on the screen showing some model gas-lighting installations for the home, using the "Metro" burner. A case of three of these burners was exhibited, containing all the parts, the perfect construction of which was pointed out. The lecturer also alluded to the ease with which the burner can be placed on a fitting, by means of the bayonet joint.

This was followed by some very interesting reproductions of well-known pictures. One of these was the old Westminster works of the Gas Light and Coke Company—to whom, while the view was on the screen, Mr. Dunn expressed his great obligation for assistance rendered in the preparation of his "lecturette." At the same time, he acknowledged in like manner the help given by the South Metropolitan Gas Company, and others.

A discussion followed on various points arising out of the lecture, and Mr. Dunn (who was heartily thanked, on the proposition of the Chairman) replied to a number of questions. One mattar which he had to emphasize was that gas burners and fittings, like everything else, require to be kept clean, if the maximum efficiency is to be obtained from them. In the course of the remarks, reference was made (although this has no especial reference to the home or to gas) to the possibility that, when the present lighting restrictions in London are relaxed, shopkeepers may pay more attention to the lighting of the goods in their windows, and less to the illumination of the pavement outside, than has hitherto sometimes been the case. The view was expressed that if this does happen, it will probably be in the more fashionable quarters, as in the poorer localities people like to see a lot of light thrown on the pavements outside shops. Mr. Dunn, in conclusion, pointed out that good lighting has now been reduced to a science, and made special reference to the work done in this direction by, among others, Mr. Charles Carpenter, D.Sc., and the Illuminating Engineering Society.

Coal Distillation at Low Temperatures.

The Spanish periodical "Revista Minera" for the 8th of August contained the following details of an experiment in the distillation of coal at low temperatures with the object of obtaining a liquid for use in internal combustion engines. The plant utilized consisted of a group of four inclined tubular retorts, made of mild steel, 14 inches diameter and 18 feet in length, inside which there was a rotary hollow Archimedean screw. These retorts are fed at the lower end from a hopper with a distributing drum, and drawn at the upper end into a coke conveyor. They are heated by gas so that the temperature of the contents will attain 500° C. (932° Fahr.). From the distillation of a ton of cannel coal there were obtained 17 gallons of rectified motor spirit, a similar quantity of oil for internal combustion engines or heating, 33 lbs. of solid paraffin, and 54 lbs. of pitch. The specific gravity of the motor spirit is ·775, and it completely distils at from 60° to 160° C. (140° to 320° Fahr.). The part distilled below 100° C. (212° Fahr.) represents about 35 per cent. of the total volume.

Durability of Concrete in Sea Water.

In "Science Conspectus" (a publication of the Society of Arts of the Massachusetts Institute of Technology) some particulars are given of an interesting series of experiments now being carried out by the Aberthaw Construction Company in order to disprove the theory that the combined effects of sea water and frost rapidly destroy concrete structures. With this object in view, 24 concrete columns, 16 feet long, 16 inches square, and reinforced with bars near the corners, were constructed in January, 1909, and immersed in the water at Boston Navy Yard. They were suspended in such a manner that at high tide water reaches nearly to the top of the column, and falls at low tide nearly to the bottom. In cold weather the columns are thus alternately thawed and frozen as the tide rises and falls. The columns were made with various qualities of concrete mixed dry, plastic, and very wet. Different qualities of cement were used, and the effects of waterproofing materials, clay, and other additions to the concrete are being studied. One of the columns was mixed with salt water, but this was unfortunately lost in handling. No final conclusions are possible yet. When examined in December last, many of the specimens were practically unaffected, but others were badly eroded. As might be expected, the best results were given by the specimens richest in cement and mixed wet. For instance, of two columns made with 1 part of cement to 1 of sand and 2 of stone, the one mixed dry was badly eroded over the whole of its length, whereas the other, which was mixed very wet, was only slightly pitted. The experiments are being continued.

HYGIENIC TESTS FOR GAS-FIRES.

[From the "Lancet," Oct. 17.]

We continue to receive from well-known makers of gas-fires models for submission to the "Lancet" test for hygienic efficiency. The spirited way in which the industry has taken the matter up, and its determination to render this method of domestic heating free from hygienic reproach, are very satisfactory; and we are glad to have played a part in the work. But we do not forget, and have pointed out before, that much to their credit the movement was begun by a firm of gas-fire makers—namely, the Davis Gas-Stove Company, who introduced the "Shadowgraph," an apparatus designed for detecting the escape into the room of water vapour from the fire. Its action depends on the deposit of moisture upon cooled glass brought in front of the canopy of the stove. This invention has done excellent service, and it inspired the introduction of another test which was devised in the "Lancet" laboratory. The test is a chemical one, and admits of simpler execution. It consists in allowing a small amount of carbon tetrachloride vapour to flow into the gas-air stream. A piece of chalk soaked in carbon tetrachloride is simply placed near the air-inlet. The result is that a correspondingly small amount of hydrochloric acid gas is produced. If now a piece of sponge containing liquid ammonia be brought to points along the canopy of the fire, fumes of ammonium chloride will be formed if the products of combustion are escaping into the air instead of passing through the flue nozzle to the chimney. We have now examined over twenty-five models by this method since our first report was issued; and every one of them has passed the test satisfactorily.

The following fires were recently sent in by Messrs. Fletcher, Russell, and Co., of Warrington, and 134, Queen Victoria Street, E.C.: (1) "Rosario"; (2) "Palermo"; (3) "Toledo"; (4) "Borneo"; (5) "Dee"; (6) "Dart"; (7) "Dove"; and (8) "Dane." All the fires were of modern design, and not one showed leakage of products of combustion when submitted to the test. The test was made in the open room both with and without a 2-feet flue attached. The 2-feet flue was not found to be necessary.

The Planet Foundry Company, Limited, of Guide Bridge, near Manchester, and 28, New Bridge Street, have sent the following fires: (1) No. 2 "New Mars"; (2) No. 2 "New Venus"; and (3) No. 2 "New Saturn." These are well-designed fires and evidently constructed with hygienic considerations in mind, since they all passed the test satisfactorily in the open room without a flue attached. We should like to make the suggestion, however, that the maximum consumption of gas in these stoves might with advantage be increased in order to extend upwards the incandescence of the radiants.

LIGHT FOR THE PROOF OF DOCUMENTS.

This was the subject of a paper by Mr. Albert S. Osborn, an Examiner of Questioned Documents, prepared for the recent annual meeting of the American Illuminating Engineering Society. As intimated in the synopsis given in the "Journal" for the 6th inst. (p. 31), the author discussed the conditions surrounding the examination of documents offered in evidence in court-rooms. The following are extracts from the paper.

Light is an important factor in the proof of documents, and lighting engineers can promote justice by making it easier to prove the facts regarding disputed documents. Anything relating to the subject of illumination that affects the quality of human vision is of vital importance in all forgery investigations. Justice has been defeated many times because court-rooms, like cathedrals, have been lighted with a dim light somewhat in harmony with some of the hampering old legal precedents. Partly because of poor illumination, judges and jurors in many instances have not been able to see properly, where the case depended chiefly upon visible evidence. This partial blindness in the past has been due in some degree to an ancient legal procedure that threw a twilight gloom around legal investigations, weaving such a network of restrictions about them as made it difficult to prove a physical fact. Strange to say, objections are still made to the use of the microscope, to photographs, and to aids of every kind; and these objections, even in these days, are now and then sustained. All these old restrictions have been intensified by poor lighting and improper physical surroundings, as well as by individual, but unconscious, deficiencies in seeing ability; for there is, in fact, a form blindness akin to colour blindness.

The whole question of human vision, and the aids that perfect and intensify it, is naturally closely related to the question of discovering forgery and the numerous other physical conditions that may point to frauds of various kinds in connection with disputed documents, and is of special importance in connection with the showing and proving of these facts in a Court of Law—often against prejudice, and usually with untrained men who must be made to see and to understand.

Under the old legal practice, now happily but all too slowly passing away, expert testimony regarding forgery and documents, involving as it does many technical interpretations of visible evidence, was mainly the giving of bare oral opinions on a contested question in Courts of Law. A new practice, however, has developed in most jurisdictions in connection with the proof of physical facts relating to documents, by which referee, judge, and jury are actually shown the basis for whatever opinion is given, so that with the assistance of reason-giving testimony, now admitted in almost all courts, and with the aid of instruments and enlarged, properly grouped photographic illustrations, they can finally reach their own conclusions regarding the disputed fact. Testimony is not simply oral, as in the past, but visible as well.

It will readily appear that this change of practice regarding visible evidence renders necessary such an illumination of court-rooms or trial chambers as makes it possible to see with the utmost distinctness. To the end, therefore, that visible evidence in cases of this class, and in all kinds of cases, may be presented with the utmost clearness and force, it is highly important that an illuminating engineer should be consulted in regard to the arrangement and lighting of every court-room.

A visit to many a court-room is sufficient to show how such a room should not be arranged and should not be lighted. Artistic and architectural considerations, in many cases, would seem to be the only ones that had been consulted in the arrangement. In many a city of our land, of all places, the court-room is the one where it is most difficult to hear and see; and the administration of the law could be greatly aided by the lighting, the ventilating, and the acoustic engineer. Trials should be held where every word spoken can be heard distinctly, and where every piece of visible evidence can be clearly seen for exactly what it is.

There are many court-rooms so dimly lighted and so improperly arranged that it is almost impossible in them to prove forgery when such proof must be based upon the correct interpretation of delicate but highly significant visible evidence. In some few cases court and jury leave their accustomed places, and in an informal and sensible manner gather around some low-placed clean window where all can see and hear.

In connection with the proof of many different questions relating to disputed documents correct and adequate illumination is absolutely essential if the facts are to be proved. Vital evidence is sometimes based entirely upon the interpretation of indistinct stains or delicate tints or colours, which, under the dim light provided, all become a dull and indistinct grey. In cases involving chemical erasures, in which certain indistinct yellow stains are of the utmost significance, such evidence is practically invisible under the yellow flickering artificial light or the dim daylight of the average court-room.

Light is also a great aid to justice in connection with the subject of photography as now applied to the investigation and proof of disputed documents. To the modern examiner of disputed handwriting and documents, the photographic camera bears a relation to the business similar to that of the compass to the mariner. The relation of light to this question of photography is as close as the etymology of the word itself suggests. It writes out in a universal language its unmistakable interpretation of many things. Many disputed document cases are hastily settled as soon as they are properly illuminated by the photographic camera.

Another condition under which special illumination is of great value is in the interpretation of certain kinds of erasures, especially those of pencil lines. The disposition of thousands of dollars may depend upon the interpretation of a few words or even a few figures, and the determination as to whether or not they have been changed. Unlike an ink line, an ordinary pencil mark is made by sufficient pressure on the writing instrument, so that a certain amount of graphite is worn off against the surface of the paper. If a mark of this nature is carefully erased so that the colouring matter is removed, it may become entirely illegible, though the depression still remains, but is so shallow that it is invisible even under the microscope. If, however, such an erasure is photographed in enlarged form with a strong illumination through a narrow slit on one side with the rays of light almost parallel with the surface of the paper, the shallowest depression, where a word or figure has been so effectually erased that it is totally invisible under any other examination, then produces a shadow which, in a photograph of this kind, sometimes shows with absolute distinctness what was originally written.

Another class of cases under which the question of perfect illumination is of vital importance is in all ink investigations either to determine age or to discover whether two or more ink writings are identical or different. Some of these questions can no more be answered under the illumination of certain court-rooms than they could be answered in the light of the average cellar; while the same investigation, if conducted under properly diffused white light, shows a result that can be seen and appreciated by any intelligent man. It is easy to understand how desirable it may be, under certain circumstances, to show that writing is not so old as it purports to be, or to show that an addition or interlineation in ink is the same as, or different from, other parts of the same document. The interpretation must be based mainly upon the recognition of certain colours.

Another interesting special application of light that promises to assist in disputed document cases makes use of those strange new rays of the spectrum which are out beyond the violet. By the use of a suitable screen and appropriate illumination, it is possible to photograph totally invisible stains resulting from a chemical erasure, so that the original writing becomes entirely legible. Thus we see the advance of knowledge in every field supplements that in every other field; and light engineers may be of great service in illuminating unexpected dark places.

GAS-EXHAUSTERS.

By C. H. Kraushaar.

[A Paper read before the Scottish Junior Gas Association, Eastern District, last Saturday.]

All my hearers are without doubt fully conversant with the gas-exhauster as such, and with its importance in the scheme of apparatus in gas manufacture; but when, some months ago, it was suggested that a short paper on the subject would be of interest to the members of this Association, the writer readily accepted the invitation of your Secretary to prepare a few notes on the different forms of the piece of plant which many years ago was happily described by an eminent engineer as "the heart of a gas-works." With the exception of the very smallest gas-works, it is recognized as impossible to manufacture gas economically without the aid of an exhauster, and for many years past it has been found a valuable addition to works even with an annual make of only 2 million cubic feet.

Different Types of Exhausters.

The gas-exhauster has taken several forms other than those which are to-day in almost universal use in this country, among which may be noted: (1) The exhaust fan, (2) the reciprocating, (3) Körting's steam-jet, and (4) chamber wheel gearing, the best known of which is the Roots type.

Exhaust fans of the single-wheel pattern have been employed where the total duty of vacuum and pressure was moderate, and within the range of pressure difference for such machines. The necessarily high speed, however, presented practical difficulties in the days before reliable motors for driving direct were available. This type, therefore, is principally of interest as being the forerunner of the modern turbo-exhauster, to which reference will be made at a later stage.

The reciprocating or piston type of exhauster is used in both the horizontal and the vertical form, and in the larger sizes is constructed in twin types—*i.e.*, with the steam cylinder in the centre and a gas cylinder on each side, the cranks being so arranged that the discharge from each cylinder shall cause the minimum of pulsation in the mains. An exhauster of this type entails three sets of cranks and motion work, which causes the first cost to be high, and in the horizontal sets also necessitates much greater floor space, when compared with rotary exhauster sets of like capacity. Considerable numbers of this type of exhauster are still doing excellent work; and, as they generally present a handsome and massive appearance, they are not likely to be replaced by the modern type, except when they become too small for present-day requirements.

The Körting, or steam-jet, exhauster has had a considerable following; but a small number only are now in use in gas-works. Its principal claim is absence of pulsation; but, on the other hand, steam consumption and extra condensers have to be considered. Certain coke-oven specialists also favoured it during the earlier period of coke-oven bye-product practice in this country; but in the cases now at work it is regarded rather as a stand-by for use in emergencies.

The toothed wheel or Roots type of exhauster is better known in this country as an air-blower; but there are several exhausters of this kind in use in the smaller gas-works. It enjoys considerable popularity, however, as a gas-exhauster in coke-oven bye-product plants, and is almost exclusively used in America, where its design for the purpose has received special attention. An important feature is its comparatively high speed of rotation, which may be taken as fully double that of a Beale exhauster of equal capacity per hour. For example—

	Beale Two-Blade.	Beale Four-Blade.	Roots Type.
100,000 cubic feet per hour . .	110 ..	80 ..	250
200,000 ,, ,, . .	90 ..	60 ..	200

Beale's Exhauster.

We now come to the gas-exhauster which is in most general use in this country to-day—viz., the Beale rotary exhauster. Several forms of rotary machine have been employed for a variety of purposes since the very earliest times; but the first practical adaptation of this type for gas exhaustion was patented by Joshua Beale in 1848, since which date many variations and improved designs have appeared. The principle, however, has remained; all the designs consisting essentially of a revolving drum or axle placed eccentrically in an outer shell or casing, and carried in bearings in the end covers. The drum in revolving transmits the motion to the slides or pistons. The outer edge of the drum runs just clear of the bottom of the casing, and the slides, which are the full length of the casing, are fitted at each end with a tongue or nose-strip, which by the aid of light springs makes contact with the periphery of the casing, and thus prevents any slip of gas past the pistons. The machine is, in reality, a combination exhauster and blower, as, in addition to drawing the gas from the closed retort, it delivers it against the resistance thrown by the various purifying apparatus and the holder.

In the first patented example there were two slides, one overlapping the other—both being guided by segments running in the circular grooves formed in the end covers. In this design the friction of the segments for one half of the revolution is taken by the inner edge, and the other half of the revolution by the outer edge. Mr. John Beale improved upon the first design by making the slide in one piece with a smaller additional slide working in it; the guiding being obtained by rings instead of segments, running in grooves in the end covers. The principal advantages were the increased surface in the internal revolving drum, the reduction of overhang of the slide when full out or in a vertical position, and the increase of wearing surfaces; further, the friction was confined to the inner edge of the rings throughout the revolution.

Efforts had been made to produce a machine which should have the slide or piston in one casting. To do this it became necessary to make the shell or casing greater on its horizontal than its vertical diameter; and the earlier of these designs had the common defect that the slide was guided in its path—*i.e.*, forced in and out of the revolving drum—by friction with the inner surface of the shell. Mr. John Beale, however, overcame this objection in his latest patent by fixing in the centre of the exhauster a rotating block carried on a horizontal fixed pin, and having on the slide two guides which engaged with the rotating block, and guided the slide independently of the cylinder casing. The slide is guided from the centre, where the velocity is very low, instead of at the periphery, as in the previous designs, where the velocity is high; the difference in the velocity being approximately as 15 to 1 for the same diameters of shell and revolutions per minute. In addition it had the advantage of securing a much greater surface for wear on the rotating block than was possible with the segment or rings, and also more wearing surface in the drum, by reason of the slide being supported across the full diameter of the drum in all positions. The horizontal diameter is greater than the vertical diameter of the outer shell. This necessarily follows from the fact that the slide being a fixed diameter over the nose-strip, the diameter of the shell at any point in the path of the slide must be constant. The shell is therefore eliptical in form; the amount of difference in the horizontal and vertical diameters being determined by the eccentricity or distance between the centres of the outer shell and the revolving drum.

In the well-known multiple-blade type of exhauster, having either three or four blades, the motion is transmitted to the slides as before by the revolving inner drum. The cylinder casing of this type of exhauster is circular; all the blades being hinged to a stiff centre pin supported in the back end cover and running the full length of the casing. The length of bearing surface of the hinges is equal on each of the blades. To each blade is fitted an oscillating roller through which it works in and out. This guides the blade along its whole length, adjusting itself to the varying angles taken by the blade throughout the whole revolution of the inner drum. It is a common feature of all the Beale type of exhausters that the speed of the tip of the slides varies widely during the full revolution.

In 1892 a further design was patented in order to obviate, so far as possible, the pulsations caused by the opening and closing of the ports during each revolution of the exhauster—a feature which is common to all the designs previously mentioned. This design is known as the two-blade compound exhauster. Just at the time when gas is passing back from the outlet main into the exhauster, it is met by a stream of gas from the interior of the revolving drum. This was effected by an arrangement of ports at the end of the drum, also in the end covers of the outer shell; and it was successful in materially reducing the degree of pulsation. In this design the guides cast on the centre of the main slide had a reciprocating motion in relation to the internal drum, and by making the internal sides of this drum flat along its full length, the main slide becomes in effect a piston, by means of which the contents of the drum are expelled twice per revolution. In addition, therefore, to reducing the degree of pulsation, a considerable increase in quantity delivered was obtained for the same size of outer shell and revolutions per minute.

It is the practice of makers, when grading the capacity of gas-exhausters, to make ample provision in the calculated contents to compensate for the difference in the temperature of the gas when passing through the machine and when measured at the station meter, and also for possible slip of gas past the slides. The latter is not considerable in well-constructed machines with the moderate pressures prevailing in most gas-works. Moreover, the tar present in the gas forms in a thin film over the surface of the end covers, and is a material factor in the prevention of slip. With regard to the temperature, however, it is very necessary for users to correct for this when testing exhausters against their rated capacity—for example, with a temperature of 100° Fahr. at the exhauster and 60° Fahr. at the meter, the difference in volume is 8 per cent. In such tests steps should be taken to ensure that no gas is being bye-passed.

All exhausters of the Beale type are positive in action—*i.e.*, the quantity of gas dealt with bears a definite ratio to the speed of rotation, with a constant pressure difference. While it may be taken as such for general purposes, this ratio is not directly proportional to the speed. Pressure difference is the factor which determines the amount of slip, which is therefore constant at all speeds; and it follows that the proportional slip declines as the speed increases.

The designs of exhauster mentioned may therefore be taken as indicating the survival of the many forms of the Beale type of rotary exhauster, and, though their main field of usefulness has been found there, it has been by no means confined to gas-works and coke-oven bye-product works; large numbers having been utilized in oil and chemical works for blowing and agitating liquids

in tanks. A modification of the Beale exhauster has also been patented as a gas-compressor. The outstanding feature of this design is that the means of driving are the reverse of those of an exhauster where the revolving drum transmits the motion to the slides or piston. In the compressor design the block is keyed to the steel shaft which is carried in bearings on the end covers. The rotary motion is transmitted to the slides or pistons by pressure of the block on the guides cast in the centre of the slide. To meet the heavier pressures in gas compression over ordinary exhausting, the area of surface in the block and the strength of the slide have been correspondingly increased. The tongues or nose-strips which engage with the outer shell to prevent slip are of special design, making a surface contact as against a line contact in the exhauster.

Exhausting Plant in Gas-Works.

Having surveyed the several designs of best-known exhausters, it is now necessary to consider the exhausting plant as a whole—*i.e.*, exhauster, motor, and governing arrangements.

While gas-engines and electric motors are used in a large number of cases for driving exhausters, through belting, spur-gearing, or direct-coupled, the most efficient and popular form of drive is by direct-coupled steam-engine. The exhauster being positive in action, and called upon to deal with widely varying quantities of gas at different periods of the year, the steam-engine, by its flexibility or speed range, affords the best means for accurate governing under all conditions. Both methods of exhauster governing—viz., steam regulator and bye-pass compensator—have their firm adherents.

Where the gas-engine and belt-drive method is employed, step-cone pulleys provide a reliable means for dealing with variation as between the winter and summer makes of gas; but the governing, owing to the speed of the exhauster being constant at any given period, must be by the bye-pass compensator method. Taking, however, the case of the steam-engine drive, direct coupling provides the most efficient arrangement.

In governing a steam-driven exhauster, it must be borne in mind that, in addition to the variation in quantity at different periods of the year, rise and fall in steam pressure, together with the varying rate at which gas is given off from the retorts, can be compensated for by adopting the steam regulator method of governing. Exhauster makers have given considerable attention to the design of the necessary apparatus, which consists essentially of a bell governor fitted with an arrangement of levers for transmitting motion for operating a special balanced steam throttle-valve. The bell floats in water, and the tank is fitted with a stand-pipe which is connected to a return tube from any point on the foul main and before the inlet to the condensers. The interior of the bell is thus under similar conditions to the foul main. The bell is constructed with an air chamber to counterbalance the effect of the vacuum. It adjusts itself in the tank to suit the varying conditions caused by the difference in rate at which the gas is given off from the retorts throughout the period of the charge, and regulates the speed of the steam-engine accordingly. By adopting the steam-governor method, the wear and tear of the exhausting plant is reduced to a minimum; and, in the writer's opinion, such apparatus is an indispensable accessory to a properly equipped plant.

It is standard practice to fit automatic lubrication to all points on exhausters; the usual forms being: (1) A self-contained drip feed, (2) the tank system (in both of which the outlet gas pressure is introduced to force the oil), or (3) the mechanical system driven from the exhauster shaft. All three methods have adjustable feeds.

Too much stress cannot be laid on the matter of lubrication, which calls for special attention to meet the various conditions of working. The tar present in the gas contains good lubricating properties if maintained in the right state of fluidity. It may here be remarked that undue bye-passing is invariably a source of trouble, resulting in carbon deposit due to the lubricating properties in the tar not being retained in the exhauster. Tar oil or solvent is found most applicable in ordinary exhauster work, except where tar-extractors are placed before the exhauster, when a good class engine oil should be used. Note should be made of the vital necessity for filtering all lubricants used for both exhauster and engine.

Steam-engines for driving exhausters should be simple in construction, with easy access to all motion work. Single-cylinder engines are preferable, and they should have an ample margin of power at slow speeds, to meet the variation in steam pressure frequently encountered in gas-works. Particular attention should be given to facilities for lubrication, and a metallic packing for both piston-rod and valve-spindle is to be recommended.

In twin sets of exhausting plant—*i.e.*, having one steam-engine driving an exhauster on either side, the engine being of sufficient power to drive both exhausters—it is advisable for the engine to be fitted with expansion gear, in order to economize the steam consumption when one exhauster only is working, when high-pressure steam is available. For the largest size exhausters, and in gas-works where high-pressure steam is available, compound engines are occasionally employed.

The Turbo Exhauster.

This is the latest development in gas-exhauster practice, and so far its adoption has been confined to coke-oven bye-products works and to the larger gas-works. The introduction of this type of exhauster is largely due to modern methods of sulphate recovery in coke-oven plants, where the gas arrives at the exhauster in a tar-free state and at a temperature of 70° to 80° C., or (say) 170° Fahr. It may here be remarked that while such conditions are certainly stringent for the positive type of rotary exhauster previously mentioned, a number of the latter type of machines are dealing with such conditions quite satisfactorily. Special attention, however, has had to be given in the building of them to the expansion of the moving parts, clearances, and lubrication. Several forms of turbo exhauster are now available, one of which is designed on the "Rateau" system. This type of exhauster is necessarily high-speed—1500 to 3000 revolutions per minute being common, and the speed being determined by the quantity and the specific gravity, temperature, and pressure of the gas to be dealt with. The high speed permits of driving by steam-turbine or electric motor coupled direct to the exhauster spindle; and this, it is often claimed, effectually disposes of all pulsation troubles. It is of either the single or multiple stage form; the number of stages depending upon the total duty of vacuum and pressure. In an exhauster of this kind having three stages, the three impellers are mounted upon the central shaft; the casing being divided into three portions or volutes. The gas enters round the centre of the first impeller, and passes thence to the first volute, from which it goes to the second impeller, and so on. There is no internal friction of the revolving impellers and the casing; the central shaft being carried in two main bearings, one fitted with thrust collars. The main bearings are attached to the exhauster body. Correct alignment is thus assured, and the whole forms one solid and self-contained machine supported upon the base-plate. Owing to the high speeds and temperature, the main bearings are usually of special design and water-cooled. The volutes or chambers comprising the casing are also fitted with suitable drains to take away possible condensation. An important feature of the turbo exhauster is the relatively small amount of floor-space occupied compared with the positive type or slow-speed rotary exhauster.

As a general note on this type of exhauster, and considering, first, the high speed, to which the majority of gas managers will need a deal of conversion, and, secondly, the matter of first cost, which is only comparable with the positive rotary exhauster in the greater capacities, it would appear that its adoption will be limited to the very largest gas-works.

In conclusion, the nature of the subject of this paper has necessitated the larger portion being devoted to the consideration of mechanical details; but the writer hopes that a useful purpose will have been served for the members of the Association.

The paper was illustrated by numerous diagrams, as well as by two models, of the various exhausters described.

OIL TAR SEPARATION, RECOVERY, AND DISPOSAL.

By R. E. Wyant, of New Haven (Conn.).

[A Paper read before the American Gas Institute.]

Separation.

In considering this subject, it is not the writer's purpose to enter into a discussion of the separation of tar from water gas—first because he has no method to suggest which is not perfectly well known, and secondly because the usual pieces of apparatus—scrubbers, condensers, Pelouze and Audouin extractors, shavings scrubbers, and purifiers—have been thoroughly tested as to their efficiency as tar separators by long and general use. Very carefully conducted tests of all these appliances have been made by Dr. A. P. Beardsley, of New Haven, Connecticut, and the results were presented by him in a paper read before the New England Association of Gas Engineers at the meeting in Boston in 1912.* These results were obtained under average working conditions, and I believe indicate what may be fairly expected of such apparatus. The tests show a production of tar equal to 14·2 per cent. of the volume of oil used. A summary of the results is given below, showing the performance in removing tar of the various pieces of apparatus in sequence.

Apparatus.	Tar Removed. Per Cent.	Efficiency. Per Cent.	Equivalent of Oil. Per Cent.
Scrubbers	21·30	21·30	3·02
Condensers	62·50	79·40	8·87
P. & A. extractors	12·96	80·00	1·84
Shavings scrubbers	2·86	88·20	0·41
Purifiers	0·37	98·00	0·05
Escape purifier	90·01	—	0·01
	100·00		14·20

It is undoubtedly true that tests may be found showing better efficiencies than those indicated for the various appliances. It must be borne in mind, however, that it is not always practicable to maintain, in actual operation, the maximum efficiencies possible for any piece of apparatus. We must make gas as needed; and varying conditions and quantities of gas passing the apparatus seriously affect the efficiency.

There is much diversity of opinion among gas engineers as to the relative value of some of the apparatus mentioned. It is

* See "Journal," Vol. CXVIII., p. 165.

sometimes maintained that the Pelouze and Audouin extractors are alone sufficient for the removal of the tar-fog remaining in the gas after condensation. On the other hand, shavings scrubbers are considered to be quite indispensable by a large number of engineers. In any case, both are introduced where the tar contained in the gas is highly attenuated, and difficult to remove; and both, at best, can remove but a moderate proportion of the total tar. The tests show that both pieces of apparatus are highly efficient in removing the tar that comes to them, and that the addition of the shavings scrubbers relieves the purifying material of about 140 lbs. of tar for each million cubic feet of gas passed. The shavings scrubbers also fulfil an important office in saving the purifying material during such variations of pressure as impair the efficiency of the Pelouze and Audouin extractors.

All the preceding remarks apply to tar in the form of liquid or fog; and it will be observed that a measurable quantity of tar per million cubic feet of gas is carried past even the purifiers in this form. In order to conserve the illuminants in gas, the various scrubbing operations must be carried on at a temperature above 100° Fahr.; and for this reason we cannot hope to remove all such tar vapours as have an appreciable vapour tension at this temperature. It is, of course, the subsequent cooling after purification that accounts, in great measure, for the condensate found in holders and drips.

Recovery.

Depending upon its disposal, the recovery of the tar after separation from the gas may or may not present difficulties. There is a small proportion of emulsion of tar and water continually formed in the condensation and separation of the tar from the gas. If the whole of the tar separated in the several scrubbing devices be passed through gravity separators and collected for prompt disposal, the emulsion passes along with the water-free tar, and forms a mixture of low water content. If, on the other hand, the tar is allowed to accumulate for long periods—as, for instance, in a holder tank—it is found that a further separation takes place between the tar having a low water content and the emulsion. The writer has passed through the latter experience. Oil tar has been stored for several years in a gasholder tank, and reclaimed by pumping, as it was required, from the bottom of the tank. This arrangement was perfectly satisfactory until it was discovered that the tar drawn from the holder suddenly contained large quantities of water. Investigation revealed the fact that the supposedly large stock of oil tar consisted of an emulsion of oil tar with water.

To determine the quantity of tar present, samples were drawn from the holder tank at definite varying elevations, and analyzed by distillation. The analyses showed a water content of from 2 to 3 per cent. for the first 18 inches from the bottom of the tank. Samples taken 2 feet from the bottom showed the presence of 46 per cent. of water; and this proportion increased rapidly to 80 per cent. of water at 4 ft. 6 in. and 90 per cent. at 12 feet from the bottom. A sample containing 6 per cent. of water (by volume) gave the following characteristics for the water-free tar:

Specific gravity 1·070 at 60° Fahr.			
Viscosity (Engler)	77° ,,		Specific Viscosity
50 c.c. in 22″	—	..	1·95
100 c.c. in 47″	—	..	2·05
200 c.c. in 1′ 45″	—	..	2 08
Flash-point . . .	119° Fahr.		
Fire-point . . .	154° ,,		
Free carbon by CS_2 extraction			0·41 p. ct.

A sample containing 66 per cent. of water by volume gave for the water-free tar the following:

Specific gravity 1·043 at 60° Fahr.			
Viscosity (Engler)	77° ,,		Specific Viscosity
50 c.c. in 20″	—	..	1·77
100 c.c. in 42″	—	..	1·83
200 c.c. in 1′ 32″	—	..	1·82
Flash-point . . .	120° Fahr.		
Fire-point . . .	133° ,,		
Free carbon by CS_2 extraction			2·17 p. ct.

It will be noted that the sample containing the large percentage of water has a lower gravity, is slightly more fluid and more volatile, while the percentage of free carbon is increased about 2 per cent.

This emulsion, even containing 90 per cent. of water, is very deceptive in appearance, as it looks like good tar. It is extremely persistent, and could not be broken in the laboratory by filtration through either paper or cloth, nor by grinding in a paint-mill. Centrifugal separators were entirely ineffective, and prolonged heating was found useless. Separation was also attempted by steam-jets in contact with the emulsion. It was finally felt that success was likely to be obtained only through a distillation process; and this method has been carried out in a simple and fairly effective manner by the use of existing appliances.

The water-gas apparatus is equipped with the usual scrubbers filled with wooden grids, following the wash-box or seal. Usually water is caused to circulate through these scrubbers, and descends against the upward flow of the gas. Tar is separated from the hot gas, and passes out at the bottom of the scrubbers with the circulating water into gravity separators. Here most of the tar is caught, and the water passes on through the separators into a collecting-tank, from which it is again pumped to the top of the scrubbers. As the circulating water is raised nearly to the boiling-point by its contact with the hot gas, it is necessary to place the circulating pumps below the tank, so that the hot water will flow to them. With this apparatus at our disposal, the tar emulsion was substituted for the circulating water, and the gravity separators bye-passed, so that the tar removed from the gas passed with the emulsion directly to the tank. As the emulsion is broken by the evaporation of its water, the tar settles to the bottom of the tank, and it is necessary only to pump out the tar each day and replace it with emulsion. By this method we are able to treat about 9000 gallons of emulsion per week.

Regarding the formation of this extremely watery and persistent emulsion, the writer has no positive knowledge. Its formation is thought to be based primarily upon the presence of free carbon or dust mixed with the tar. It is evident, however, that the quantity of water carried by the emulsion is quite independent of that of the free carbon present. In the sample already mentioned, which had 66 per cent. of water, it will be recalled that the water-free tar was found to contain only 2·17 per cent of free carbon. Vertical retort tar having from 6 to 8 per cent. is but slightly emulsified during condensation, though a 50 per cent. mixture of this tar with water can be permanently emulsified by agitation. Horizontal retort tar containing from 25 to 30 per cent. of free carbon does not approach in the emulsion formed in condensation, the water content found in the oil tar. It would seem, therefore, that the peculiar oil tar emulsion is due rather to the treatment of the tar during condensation, and perhaps to its lighter and more limpid characteristics, than to the amount of free carbon contained. From the fact that the emulsion is found at the outlet of the first scrubber, it is evidently formed either in the seal or in the scrubber, or in both. This fact suggests a mechanical formation due to the violent agitation of the newly condensed tar in the water of the seal-box.

Disposal.

For years the disposal of oil tar has been a serious problem to many gas companies; and for this reason the tar has been very largely used for fuel. While excellent for this purpose on account of its high calorific power and ease in handling, it should be worth more than its fuel value. As a boiler fuel it can be burned successfully either in combination with a coal fire or in a suitable setting alone. The latter case is by far the more efficient, if boiler equipment and tar supply admit of the isolation of one or more boilers for its exclusive use. Its high calorific value and its ease in storing and handling give low boiler cost.

Recently a much wider field of usefulness has been opened to oil tar in the demand for road material. For such purposes, however, the tar should be treated by distillation. As a dust-laying material, it has been used to some extent in the crude state; but many objections have developed in this practice. Among them may be mentioned its odour, its danger of ignition owing to its low flash-point, its liability to contain large amounts of water, and the frequent applications necessary to preserve its effectiveness. But all these objections can be readily removed by distillation either in a fire or a steam-still. The steam-still involves much less expenditure for apparatus, and is effective and rapid. For effective distillation by steam, however, it is desirable to blow live steam directly into the tar after its temperature in the still has been increased above 212° Fahr. The distillation should be continued until the specific gravity has been raised to about 1·1 at 60° Fahr., and the flash-point to about 145° Fahr. Such tar should show, by the distillation method of the U.S. Office of Public Roads, characteristics about as follows:

Degrees C.	By Weight Per Cent.		By Volume Per Cent.
To 110	0·0	..	..
110 to 170	1·0	..	1·4
170 to 270	37·0	..	40·6
Residue	62·0	..	58·0

As compared with petroleum road oil, the oil tar described is much more penetrating, and, therefore, is more readily absorbed by the dust; while the larger pitch residue builds a more permanent surface. For road surfacing the distillation should be carried further; thus reducing the penetrating capacity, and increasing the proportion and stickiness of the pitch residue.

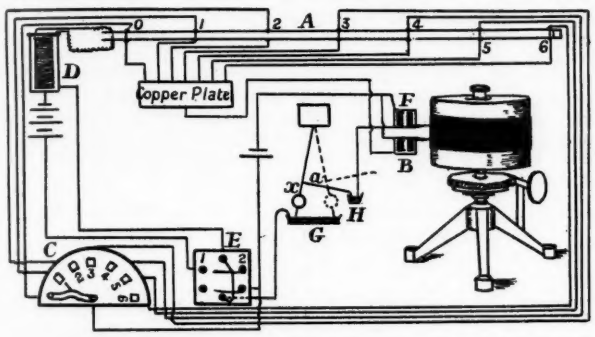
The first distillate from the tar described contains benzol, toluol, &c., and in greater proportion to the tar than similar distillate from coal tar. The intermediate distillate is of less value, but has recently been reported a good fungicide by the United States Forest Service Investigators. Because of the low free carbon content, and its differences in characteristics from coal tar, oil tar is frequently found useful in the manufacture of tar and pitch products in arriving at the results obtained. On account of the large and growing demand for dust-laying and road-surfacing materials, however, the writer feels that there need be no difficulty, at least for some time to come, in disposing of oil tar for such purposes at a fair price.

Successful Coke Campaign in Detroit (Mich.).—At the last meeting of the Michigan Gas Association, Mr. R. C. Fowler, of the Advertising Department of the Detroit City Gas Company, gave, in a fully illustrated paper, an account of a vigorous campaign he has conducted in order to stimulate the use of gas coke He started, on Sept. 14, 1913, and "boomed" the fuel in every possible way and in almost every conceivable style of advertisement. The result was that, in spite of an extremely mild winter and the strongest kind of competition from other fuels, he increased his coke sales for the season 1913-14 (from September to March) by 75 per cent. as compared with those in any previous season. The cost of the entire campaign was only 18·5c. (9¼d.) per ton of coke sold.

THE VELOCITY OF FLAME IN MIXTURES OF METHANE AND AIR.

Messrs. Parker and Rhead discuss experiments on this point in the current issue of the "Journal of the Chemical Society."

In the primary tests, the travel of the flame was followed by the eye. This method, however, owing to the great velocity in some cases, proved too uncertain; and the following interesting arrangement for recording the flame-travel was employed. The tubes were about 2·5 cm. diameter, and varied from 6·5 to 10 metres long. Thin strips of Wood's alloy (melting at 72° C = 162° Fahr.) were used as flame-indicators, and are stretched across the middle of the tube A, at the points of connection of the shorter lengths (0, 1, 2, 3, 4, 5, 6). The metal bridges are then placed in electrical connection with the magnet B by means of the switchboard C, and a copper plate. The firing agent employed consists of a single-break spark from a Ruhmkorff coil D by screwing-up the hammer-break of the primary coil, and rapidly



breaking the circuit by moving the mercury switch E, from position 1 to position 2. As soon as the flame reaches 0, the metal bridge at this point is melted, releasing the stylus B, and producing an upward mark on the moving drum. The switch C is then rapidly moved to position 1, again completing the magnetic circuit until the corresponding bridge is melted; and so on until the bridges have all been broken. The velocity of the revolving drum is measured by means of a clock pendulum. When the pendulum is in the position *x* the electro magnet F is in communication with an accumulator by way of the mercury contained in G and H, the copper wire *a*, and the mercury switch E. When the pendulum is in any other position the connection is broken, since the wire *a* is raised above the surface of the mercury in H.

In this way the stylus F is moved up and down with each swing, and corresponding lines are traced on the blackened paper. From the time of one swing of the pendulum, the distance between the bridges, and the distances between the styli marks on the drum, the velocity of an explosion may be calculated.

In discussing the actual experiments, it is pointed out that in all cases the mixtures were fired near an open end of the tube—the further end being closed. The experiments show that the propagation of flame in mixtures of methane and air generally occurs in three periods, when fired from an open to a closed end of a tube. In the first period, the flame travels with a constant and uniform velocity. The second period consists of vibrating movements, and a sudden increase in velocity. In the third period, the rate again falls to a uniform value as the flame approaches the closed end of the tube.

In tubes of a given diameter the initial velocity of explosion varies with the material of the tube—being less in tubes possessing a high conductivity for heat. The maximum initial velocity is possessed by a mixture containing 10 per cent. of methane, the rate of propagation of which is 70 centimetres per second. The initial velocity then falls with the change of methane content, moving towards zero at 4·5 and 13·1 per cent. The effect of a bend in the explosion tube varies considerably with the nature of the bend and the percentage composition of the mixture.

AMERICAN GAS INSTITUTE.

Subjects Submitted at the Annual Meeting this Week.

In preceding issues of the "Journal," abstracts have been given of some of the papers prepared for presentation at the annual meeting of the American Gas Institute, being held this week in New York. The current issue of the Institute's "News" contains abstracts of other papers, which we reproduce below.

CARE AND MAINTENANCE OF GASHOLDERS.

By J. H. Braine, of Brooklyn (N.Y.).

The object of this paper is to treat from a practical standpoint the subject of the care and maintenance of gasholders, embodying the experience of some of those best qualified to deal with the matter, and giving such extracts from technical publications as seem necessary to a full discussion of the subject. Attention is called to the fact that, though we have to consider holders built as early as 1850, the main object of the paper is to bring under notice the liability to deterioration of steel holders built within the last twenty years, and to sound a note of warning regarding them, in the hope that there may be saved, by a little timely attention now, the otherwise inevitable heavy expenditure for repairs in the near future.

The first part of the paper is devoted to the subject of corrosion, and an extract is given from an article by Dr. G. W. Thompson on this subject. The question of material (steel *v.* iron) is only taken up to the extent of quoting Cushman and Gardner's "The Corrosion and Preservation of Iron and Steel," and calling attention to the latest practice in specifications for steel and iron.

The general condition of holders found upon inspection is gone into in considerable detail; the diagram of the framework of a modern holder being given, in order to make clear the nomenclature of the various parts referred to.

A number of photographs are shown in an endeavour to illustrate more clearly the points where corrosion has been found to seriously attack sections, guide-framing, &c. The methods resorted to in the case of minor repairs, overhaulings, &c., are taken up, and illustrations given of the various special tools found useful in this work. The most recent practice adopted in the purging of holders is described, accompanied by a table showing the proportions of gas and air forming explosive mixtures.

The question of painting is dealt with in some detail, with extracts from an article by Mr. F. P. Cheeseman. References are also made to recent tests conducted by the American Society for Testing Materials. The method of applying paint is alluded to, together with special apparatus and methods used in different localities; illustrations being given of the various kinds of brushes used for holder painting.

The practice adopted by companies for the installation of steam-piping on holders is gone into in detail; and a description is given of recent types of steam hose and tank and cup jets, accompanied by a tabulation showing the number of cups and tank jets and size of piping used on different sizes of holders. A description is given of a hot-water heating system for gasholders, using the exhaust steam from the exhauster engines at a steam-driven pumping-station.

The paper closes with a list of suggestions on the subject of design by Mr. Fred. H. Wagner, together with notes on recent improvements in design observed by the writer in inspecting holders of recent construction.

DECOMPOSITION OF COAL BY HEAT.

By H. C. Porter and G. B. Taylor, of the United States Bureau of Mines.

The decomposition of coal under the influence of heat—whether rapid, as in high-temperature retorts, or slow, as in processes of low-temperature carbonization or in the mechanical stoking of boiler furnaces—takes place in stages. The preliminary stage is low-temperature decomposition, and the liberation thereby of certain primary products. These have been shown to be largely made up of hydrocarbons of the paraffin type (liquid and gaseous), water, carbon dioxide, and possibly hydrogen.

Following this preliminary stage occurs the decomposition of the solid altered residue, yielding hydrogen, carbon monoxide, and more hydrocarbons, and finally the very important process of secondary thermal decomposition of the early volatile products, liquid and gaseous. This latter stage produces illuminating hydrocarbons, aromatic derivatives such as benzol and naphthalene, phenols, hydrogen, free carbon, and many other substances.

By a study of the primary decomposition processes, some light is thrown on the nature of the early products of which the secondary decomposition gives the final gas and bye-products, and also leads to certain conclusions as to the probable constitution of coal substance.

Experiments on the low-temperature decomposition of coal *in vacuo* are described, as well as certain preliminary experiments on the secondary thermal decomposition of the volatile matter. Previous work of other investigators along these lines is reviewed.

PURIFIER INSTALLATIONS.

By C. E. Paige, of Malden (Mass.).

It can be stated that purification methods have been or are capable of standardization. In many plants impurities are removed by methods which would be entirely impracticable in other plants; and there are many conditions which determine how purification problems are solved in various gas-works.

At first slaked lime was used, and it was satisfactory when low sulphur coals were carbonized, and where economy was of no particular importance. On account of the expense, this method has been superseded by the use of oxide of iron and various natural ores. Several methods of washing and heating the gas are mentioned.

At first boxes built of cast iron were commonly used, with reinforced sheet-iron covers of the wet-seal type, placed four in a set, and controlled from one central point by a centre seal-valve. The objections to this system are that it is difficult to keep the joints of the seal sufficiently gas-tight, and only three out of four boxes can be kept in operation. The gate-valve

system, on the other hand, permits the keeping all four boxes in operation, except for the time of emptying and refilling.

The author describes the old installation at the Malden Gas-Works, and says that the principal consideration in planning for the extension of an equipment was ground space and investment. In working out the purifying capacities, the formula given in the "Catechism for Gas Engineers" was used. Other things being equal, outside purifiers have the advantage in not involving any heavy fixed charges for building, and being safer to operate. As to the design, it being important that the gas should pass through the entire area of the material, the top of the box should be removable. The question of materials of construction is one of expediency. To avoid the erection of a building, some form of insulation for keeping the boxes warm must be considered. Wishing to take advantage of the heat-insulation properties of the ground, concrete was adopted; and as it was decided to remove the oxide by shovelling, the top edge of the box was placed only far enough above the surface of the ground to allow it to be emptied by shovels and filled by wheel-barrows. To obtain the greatest purifying capacity per unit of area, the boxes are made so deep that they would require stage shovelling for emptying. This is thought to be economical in the long run, as the boxes were large enough to avoid frequent changes.

Four boxes were built, each 25 ft. by 30 ft. by 10 ft. deep, equipped with 20-inch connections and a direct gate-valve system. The walls are 2 feet and the bottom is 9 inches thick. A mixture of 1 : 3 : 5 was used. The covers are reinforced with 15-inch I-beams, and are of the dry-lute type; the gasket coming down on an I-beam embedded in the concrete. The boxes were waterproofed by chipping the inside surface, applying a ¾-inch layer of practically neat cement, and coating this with pitch on one box. On the others the pitch was omitted. All passed the test for tightness very successfully, and after a year's use no leakage has been observed. The author calculated the cubical content of these boxes, allowing 20 per cent. for beams, trays, ducts, &c., and the actual cost of the installation per cubic foot of net oxide capacity was slightly more than 84 c. (3s. 6d.). The boxes are equipped with four layers of trays with inlet and outlet ducts arranged so that the gas may enter at the middle and go up and down through the oxide, or may enter at the top and bottom and leave at the middle, or through the top or bottom, leaving the boxes opposite the point of admission.

The paper contains a tabulation of the answers given to a letter of inquiry sent out to a great number of gas companies in regard to the kind of box used, seals, purifying material and its arrangement in the box, gas flow, &c., and the method of revivification of material; costs and depreciation; state or municipal restrictions regarding the purity of the gas, purifying material, and safety equipment. A circular wooden tank used at Oakland, California, for purification is described, and details are furnished of the method of preventing it drying up and falling to pieces.

REPAIRING AND TESTING METERS BY A SMALL COMPANY.

By CHARLES OTTEN, JUN., of Haverhill (Mass.).

In dealing with this subject, the writer has considered the needs of a small gas company—that is, a company supplying a community of from 45,000 to 50,000 inhabitants, and having in operation about 10,000 meters. It has been the endeavour to trace the incidental work connected with the meter department through the various stages from the purchase to the final use on the district.

A sufficient stock of meters should always be kept on hand, so that there can be no delay in executing orders. The detail of handling new meters when received is described, and forms for keeping a record for each meter are reproduced. The floor-space in the shop can be used to the best advantage if the three and five light meters are placed on portable racks.

After the meter has been set or removed, and the completed order is turned in by the fitter, an entry is made in the meter-record book, specimen copies of forms suitable for which are shown, and the details incidental to this record given.

All meters to be set, also those removed, should be carefully handled and kept in an upright position; the inlets and outlets should always be stoppered. While the meters are being transported on waggons, they should be protected by felt pads or straw, or carried in carpet bags. A photograph of a meter in a carpet bag is given, and another showing a convenient way for the fitter to carry a meter by means of a leather strap.

It is generally conceded that the best location for the meter is near the point where the service-pipe enters the cellar. This location is easy to designate, and plumbers can lay out the piping so that the risers end near this point. Since it will not always be possible to have the meters fixed as just described, the question of a proper position should then be carefully studied, so that the best place may be obtained.

The meter connections must be made so that the inlet and outlet pipes are not strained. This can best be accomplished by using a short lead connection on the inlet or outlet connection, or on both, or by the use of either rigid or adjustable meter connections. When using lead or iron pipe and fittings for meter connections, a shelf should be placed under the meter. All connections should be so installed that the meter will stand level, and be a few inches from the wall. The height of the meter should be such that the index can be easily read by a person of average height when standing on the floor in front of the meter.

Some companies do not leave any meters on the district after a customer orders the supply of gas to be discontinued, while others turn the supply off at the meter cock, and let the meter remain. If the latter practice is followed, a careful record of turned-off meters should be kept, and any that have been locked for a certain period should be removed; otherwise the former meters will run up to a considerable number, and mean a large investment bringing no return.

All removed meters should be immediately sent to the proving-room upon their arrival at the shop, and be put under the check or proof test within 24 hours after removal. The extent to which a meter is to be overhauled is usually decided by the result of this test. The further tests to which a meter should be subjected and the necessary repairs are described in the paper. Care must be taken to replace the fittings on the meter from which they were removed; and in order to identify the valves, &c., they can be placed in a small numbered bag, and a nut with a corresponding number placed on the inlet of the meter.

In a company such as is referred to in this paper the shop organization should consist of one experienced meter repairer, who should be in charge, and he should have at least two men as helpers. Whether this is sufficient help depends on the length of time the meters are left on the district before being removed on account of age. One of the helpers should be able to do ordinary meter-repair work, such as putting in diaphragms, grinding valves, repacking stuffing-boxes, putting in indices, &c.; while the other may be a lower-priced man, and do the topping-up of meters, replacing fronts and backs, painting, boiling of meters to be repaired, &c. The shop foreman should do the adjusting and final testing, and as much regular repair work as possible.

INSPECTION OF INTERIOR GAS-PIPING.

By A. E. TURNER, of New York City.

Of the various portions of the distribution system, house-piping is the only branch not controlled by the gas company; and in case of faulty construction there is scarcely any redress after it is once installed. The specifications of different companies vary widely; some being very explicit, while others are indefinite. There is, moreover, a great difference in the number of outlets allowed for various sizes of pipes. As to the number of tests to be made and the requirements as to test pressures, also, there is really no uniformity.

In some cities, such as New York, Boston, and Chicago, municipal ordinances require the piping to conform to specifications; in others, such as St. Louis, the gas companies have had the local associations of plumbers and architects approve their piping rules, and have asked the co-operation of the architects, owners, and builders in having embodied in their specifications a clause requiring that all work should be done in accordance with the regulations of the company.

The relative benefits derived from city as opposed to company supervision depend upon the thoroughness of the inspection. The municipal officer has authority to compel the fitter to instal the work according to the specifications, which the company's inspector cannot do; but the city inspector will probably not take the same interest in the work, and see that the specifications cover all points, as will the company's employee. It is just as needful to inspect the installation of the piping in buildings undergoing alterations as in new buildings.

In testing, it is very important that the inspector should make sure, by loosening caps in different parts of the building, that the entire system is under test, as there have been instances where sections indicating slight leaks have been cut off without the knowledge of the inspector, and after his visit have been re-connected to the passed lines. The practice of filling the pipes with water to rust-up leaks should also be condemned.

The author submits a suggested set of standard specifications for house piping, covering material, location of pipes, and meters, sizes of pipes and openings, fastening, general installation and workmanship, and inspection.

TAR FORMATION TEMPERATURES OF AMERICAN COALS.

The "American Gaslight Journal" for Aug. 31 reproduced Bulletin No. 635 of the University of Wisconsin—a report of investigations covering various grades of American coals, to determine (*a*) the temperature limits of the formation, (*b*) the temperature of maximum evolution, and (*c*) the relative quantities evolved from different coals.

When bituminous coal is fired in a boiler furnace, the volatile constituents are driven off at a comparatively low temperature and appear above the fuel bed. If the air supply over grates is insufficient or cold, or if the volatile matter is chilled by cold parts of the boiler, carbon is deposited as soot, or floats out as dense smoke. The practical problem is to cause the volatile gases, carbon monoxide and tar vapours, to mix with high temperature air. A better knowledge of the temperatures at which tars distil, and the rates at various temperatures is then of

material aid in designing furnaces and grates for the best firing of the coal.

In coke manufacture, with the introduction of bye-product processes, this information also is of service. Perhaps the most important field of its application, however, is in bituminous gas-producer work, where tar vapours are particularly troublesome if carried over to the gas-engine. Complete separation of tar is difficult and expensive. Attempts have been made to burn the tar and to "crack" it up into fixed gases.

Tar formation temperatures have to be considered in such efforts—as, for instance, if air is introduced to unite with the tar at the last point where it is evolved in the fuel column, this point is determined by the temperature. In the scheme of drawing tar vapours off the top of the fuel column, introducing them under the grates, and drawing tar-free gas off at the centre height, such knowledge as mentioned is essential in securing good gas without excessive heat losses.

In the studies undertaken, furnace conditions were similated, but with such apparatus as afforded good control. It was desired: (1) To heat the coal slowly and at a uniform rate; (2) to conduct the heat to the centre of the coal body by good conductors; (3) to know the temperature of the coal at all times; (4) to sweep-out the evolved gases as rapidly as formed; (5) to cool the gases and continuously test for tar; (6) to prevent low-temperature deposition in the pipes and later high-temperature redistillation.

The furnace was of resistance-coil design. The coal was held in a cartridge, 2½ inches in diameter, with small inlet and discharge pipes for passing inert gas, and a thermometer well. To transmit the heat to the interior, perforated iron discs were packed in the coal ½-inch apart. The sweeping-out gas was air with the oxygen burned out, furnished under pressure and at full furnace temperature. To test for tar a small stream of the gases direct from the cartridge was chilled and caused to impinge at high velocity on a paper ribbon—any trace of tar showing on the paper. Not quite all the tar evolved is secured, owing to the rebound of the smallest and lightest of the tar particles. The deposit, however, probably is nearly proportional to the entire tar content. To prevent redistillation, the pipe leading out of the cartridge was changed every five to ten minutes.

A study of the tests and results leads to these generalizations:

(1) Tars begin to distil from any grade of bituminous coal or lignite at about 300° C.

(2) The maximum evolution is between 375° and 475° C.

(3) Tars have been all evolved on reaching 550° C. usually, though 600° was obtained with a few coals.

(4) Formation temperatures are not dependent on the geological age of a coal, amount of volatile matter, or carbon-hydrogen ratio in the class tested; tars may appear or disappear at approximately the above temperature with any grade of American bituminous coal.

(5) No relation is evident between evolved tar and the amount of volatile matter in the coal.

(6) A distinct relation is seen between amounts of tar evolved and the carbon-hydrogen ratio. Maximum amounts of thick tar came from coal with this ratio ranging from 13·5 to 18. Knowing the carbon-hydrogen ratio of two coals and the tar evolution of one, the yield can be predicted with considerable accuracy for the other.

(7) The volatile matter of western coal contains fixed gases and watery vapours of low calorific value—shown by small amounts of tar deposited and low-heating value of coal.

Specific data for eleven different coals are given in the table.

Tar Formation Temperatures of American Coals.

Coal.	Carbon-Hydrogen Ratio.	Volatile Matter. Per Cent.	Tar Starts. Deg. C.	Temperature of Maximum Tar Deposit. Deg. C.	Tar Ceases. Deg. C.	Per Cent. of Sample Deposited on Paper.	Per Cent. of Volatile Matter Deposited as Tar.	Heating Value. Unit Coal.
Pocahontas	19·1	17·95	320	420 to 475	560	0·177	0·988	16,090
Youghiogheny	15·8	33·13	280	370 ,, 540	600	1·705	5·16	15,787
Carterville	15·3	31·34	300	380 ,, 460	520	..	..	14,820
Iowa No. 1	13·4	36·63	260 260	360 ,, 480 350 ,, 475	540 535	0·805	2·194	14,949
Kentucky No. 2	12·7	37·96	375	380 ,, 620	655	0·351	0·923	14,918
Indiana No. 2	12·3	41·75	295 300	370 ,, 420 390 ,, 430	545 560	0·55	1 32	14,780
Illinois No. 1	12·2	39·24	280 275	370 ,, 435 350 ,, 475	580 575	..	..	14,643
Wyoming No. 2*	12·2	37·68	300 300	380 ,, 490 365 ,, 480	520 525	0·422	1·122	14,542
Iowa No. 5	11·2	38·59	280	345 ,, 440	525	0·332	0·86	14,531
New Mex. No. 2*	11·2	36·29	312 318	380 ,, 450 385 ,, 460	525 520	0·234	0·64	14,350
Colorado No. 1*	10·6	32·95	270 270	375 ,, 400 350 ,, 405	500 515	0·189	0·573	13,523

* Coals marked thus are "Cretaceous;" all the rest are "Carboniferous."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Welsbach Company and its Shareholders.

SIR,—Mr. Charles S. Garland, the Chemist of the Voelker Company, who recently procured 26 Welsbach shares just in time to enable him to attend our annual meeting, professes to give, for the benefit of your readers, the facts and figures of the holdings in the Welsbach Company.

It is very thoughtful of a gentleman connected with a rival concern to busy himself with the affairs of our Company; but the information he conveys would be more valuable if it were less inaccurate and misleading.

As you, Sir, point out in your editorial foot-note to Mr. Garland's letter, "these figures [as given by Mr. Garland] do not show the total British holding as disclosed by the Welsbach Company."

Our letter published in your issue of the 5th inst. showed that the British shareholders and stockholders number upwards of 3500, whose aggregate holdings exceed £237,000 in shares and debenture stock—mainly the latter, which constitutes the primary and paramount security. This, Mr. Garland conveniently ignores.

As we frankly pointed out, the Auer Company, on the Welsbach reconstruction, paid £100,000 in cash, and guaranteed £240,000 in debenture stock, which went into the coffers of the British shareholders. In exchange for this the Auer Company obtained 165,000 shares, on which they have not received, and cannot (as things now stand) receive, a single penny piece. In addition to the £100,000 of cash paid to the old Welsbach shareholders, there have been paid, since the reconstruction of the Company, in principal (redeemed) and interest on the debenture stock upwards of £60,000 in cash. So the cash account of the English holders may be put somewhat as follows:—

Cash paid the Auer Company	*Nil*
Cash received as the result of their intervention	£160,000

[While the British holders still retain in hand a large block of the £240,000 of debenture stock guaranteed by them and secured as a first charge on the assets of the Company.]

If ever there was a case in which the Germans have burnt their fingers, and in which the British have come out on top, it is the Welsbach case.

May we venture, as Mr. Garland has been agreeably occupying his leisure with the file of our Company at Somerset House, to pay a similar compliment to his concern, which, though small, is somewhat assertive. Whether this quality be due to the fact that the Company which so freely advertises itself as "All-British" is presided over by an American is not for us to decide. Its capital, according to the returns at Somerset House, consists of shares of the nominal value of £37,500, of which nominal value £30,284 is held in seven holdings, while the total number of shareholders is less than 140. We find, therefore, fewer than 140 Voelker shareholders (not "All-British") holding £37,500, compared with 3500 British shareholders and stockholders holding upwards of £237,000 in Welsbach stock and shares—the list being representative of all the best elements of the British investing classes, from small traders and people of moderate means to Privy Councillors, Peers, Members of Parliament, Bishops, Clergy, Officers of the Army, Navy, Civil Service, Merchants, Manufacturers, and Bankers.

In view of your correspondent's thirst for inside knowledge of a competitor's business, it is instructive to note the observation of the "Stock Exchange Year Book" (1914) in reference to his own Company: "No information is now obtainable from this Company, as to its accounts."

When, therefore, Mr. Garland, of the Voelker Company, the proud possessor of six-and-twenty newly-acquired Welsbach shares, desires to be taken specially into our confidence, and offers (conditionally) to give us all the help in his power, is it remarkable if, like the Trojans of old, we suspect an adversary, when offering gifts, and not the less since he has so recently and (for him) so opportunely, put on our uniform?

On one point, at any rate, we are in unison with an aspiration of Mr. Garland. The Union Jack is nailed to our mast, and the guiding influence of the Company's policy is wholly British. The gentleman is mistaken in his assumption as to its policy in the past.

On behalf of our 3500 British share and stock holders and our 800 British employees, the beneficiaries in the business of the Company, we require no favour, but demand fair play.

E. J. BUTCHER, Secretary,
Welsbach Light Company, Limited.

344-354, *Grays Inn Road, W.C., Oct.* 19, 1914.

Calorific Value: What is it Worth?

SIR,—As most of Mr. Norton H. Humphrys' criticism [see "JOURNAL" for Sept. 29, p. 718] of my article "Calorific Value: What is it Worth?" is based upon a misconception of its contents, let me briefly indicate the points it was desired should be raised. Dealing with coal gas, they were:

(1) Calorific value is not a measure of quality. This appears to be accepted.
(2) The lower calorific gases may show less illuminating power in the incandescent mantle owing to the fact that at the existing pressures of supply, the same proportion of value cannot be recovered as with the higher qualities at the same pressure—this being due to an increased hydrogen content.
(3) When the full amount of air is injected at the air-holes, the conditions are altered, and the lower calorific gases have probably the greater luminous value in the mantle.
(4) When less than this amount of air is injected, value is more or less proportional to the pressure of supply.

Those who have studied the matter will appreciate the accuracy as well as the absurdity of this fact. A company may supply a gas of 540 B.Th.U., at a pressure of 8-10ths of an inch, and thereby in every way comply with the law; but let the same company supply a 495 B.Th.U. gas at a pressure of 5 inches, and it is liable to penalty, though the value of such a gas to the bulk of consumers is more than the legal minimum.

The ultimate issues of the problem are only in the theoretic stage; but there is this valuable side-light to be obtained from it—namely, the possibility of obtaining an immediate reduction in the calorific standard commensurate with the limit of increase in the pressure of supply practicable under present conditions. Big changes at one sweep are impossible; and perhaps the difficulties in Mr. Humphrys' mind will fade somewhat if he thinks of a pressure of 10 inches—if that be the figure—as a limit to be reached in twenty years. But I might say that there is a general tendency to increase upon the pressures of supply, apart from legislation. I have found pressures of 6 inches on mains at least three miles from the works.

The fluctuating conditions of pressure over any system of supply, apart from the number of different burners in use, renders it impossible that, under any standard, the consumer will know exactly what he is getting for his money. No attempt was made to find such a standard. Mr. Humphrys is also in error when he says that I "would favour a dilution of the town gas as usually supplied, with a mixture of combustible gas that contains a high proportion of hydrogen, if sent out at a pressure that would draw in at the air-holes of the bunsen burner all the air required for complete combustion, without risk of firing-back." I certainly should not, until the utility of such a supply was proved. It was suggested that an investigation of the matter might be fruitful in proving the efficiency of such a supply, and in reducing "generating costs." Exactly what would happen under specified conditions, it is impossible to say without trial; of the probabilities, some have clearer ideas than others. The reference Mr. Humphrys makes to air-regulation and its possibility in increasing mantle luminosity is pathetic.

With regard to Mr. Arthur Forshaw's Institution paper of 1909—entitled "Illuminating Efficiencies of Carbon Monoxide and Hydrogen Used in Connection with the Incandescent Mantle"—I have now read it for the first time. As was pointed out in the editorial, it has no bearing at all on the matter. The paper is based upon the unjustifiable assumption that the net illumination given in an incandescent mantle by a gaseous mixture is the sum of the illuminating powers of the constituent parts. There is every reason for believing that this is not the case. In the next place, the importance of reproducing the mechanical and physical conditions of the consumer's burner was entirely overlooked, even in the first essential—that the air shall be injected from a stationary atmosphere by the pressure of the gas itself.

We are not told by Mr. Forshaw anything about pressure or things relating to it. But if the experiments were conducted at the ordinary pressures of supply, the conditions of burner were precisely those under which only a small part of the value of the gas could be recovered in light. In undertaking such investigations, one must clearly recognize the importance of the burner not only in determining rates of flow, but something just as vital in the velocity of ignition of the gas air mixture. In the ordinary consumer's burner, and approximating to the facts, gas rushes on a stationary atmosphere at a speed of over 100 miles per hour; but it is delivered from the burner-head at about one tenth of this rate. It can be well understood that in the burner-tube a considerable state of turbulence exists, which is augmented to a greater or less degree according as the burner itself retards the progress of the moving gases. The destruction of the velocity or rate of flow would be greater in the case of hydrogen than carbon monoxide for the same amount of air injected. The velocity of ignition, of course, increases with the turbulence existing in the mixture. The practical result of a decreased rate of flow and an increased velocity of ignition, is less light from the mantle for a given amount of gas consumed.

Mr. Forshaw realized that the construction of the head of his burner was far removed from anything possible to the consumer; and in using two nipples (a different one for hydrogen and carbon monoxide) in the same burner-tube, he really used two burners producing different conditions.

Any real comparison of results obtained by different observers is difficult; but it would be interesting to know why Mr. Humphrys in his article mixed up the results of Messrs. White, Russell, and Travers for coal gas and carburetted water gas with those of Mr. Forshaw for hydrogen and carbon monoxide.

There are a few uses to which gas is put, in which the greater part of the heat is recovered and does effective work. The consumption by them is small. Examples are: Geysers, Bonecourt boilers, furnaces, &c. I believe that it is claimed that the Bonecourt boiler utilizes over 90 per cent. of the B.Th.U. The operative principle is that of surface combustion—the influence of hot surfaces in accelerating combustion.

It is only possible to utilize this large proportion of the heat energy of gas when heat is recovered from the products of combustion. In very few cases can this be done; and, of course, the heat loss through the combustion products is greater with the higher calorific gases than with the lower calorific gases. The gas-fire is a case where the products of combustion escape; and it is particularly interesting because its efficiency is largely dependent upon the action of hot surfaces in accelerating combustion. Hydrogen is more susceptible to surface combustion than any of the common gases. Accelerated combustion means a more intense, if a less, flame. Loss of radiating area is more than counteracted, as radiation from a hot surface is proportional to the fourth power of its absolute temperature [Stefans law]. Take a very simple example. Supposing a certain amount of gas was made to heat a given area of fire to 1600° C., or twice that area to 800° C., the radiating power of the former would be more than four times the amount of the latter.

We may, however, continue theory to no end; the practical thing is to investigate on the lines suggested by theory, and as was pointed out in your "Editorial Notes" three weeks ago. Unless such an investigation is thorough, it is hardly worth while. If any large company would grant adequate facilities for the work, I should be pleased to undertake it.

Three weeks ago, I mentioned Mr. J. Husband's name in connection with the Sugg 1874 argand burner. I said he first called attention to the existence of the patent. Since writing the article, I have found that the credit is due to Mr. A. A. Johnston, the present Engineer and Manager of the Brentford Gas Company.

J. H. FAIRWEATHER.

62, Wythes Road, Silvertown, Oct. 16, 1914.

[As we intimated at the time Mr. Norton Humphrys' article appeared, it was clear he had laid himself open to attack by adopting Mr. Forshaw's 1909 conclusions with plain hydrogen to destroy Mr. Fairweather's submissions. He has now to meet the destructive criticism of his position as found in the above letter. We hope some large company will be sufficiently enterprising to close with Mr. Fairweather's offer to undertake, if adequate facilities for the work are provided, a thorough investigation of the matter that he has raised in his articles. —ED. J.G.L.]

Tar Prices.

SIR,—In reply to "Your Reporter's" query [*ante*, p. 85], in view of the fact that "Treasury Notes" are being issued to bankers against securities for the express purpose, *inter alia*, of enabling them to finance legitimate industry during the war, I even venture to think that a refusal to do this might, upon representation being made in the proper quarter, result in the application of such pressure as would induce a change of mind in that respect—to say nothing of the stock of pitch being assumed to be the bankers' only consideration.

I was not aware before seeing "Your Reporter's" assertion that the other assumption, that it will be impossible to export pitch till the war is over, was mine. Rather I had the impression that it was because the tar distillers had fears in this regard they had raised the questions under discussion.

I am sorry to be unable to follow either the mathematics or the reasoning involved in a comparison of cost per ton of pitch to distiller with cost per ton of coal carbonized to gas company. It appears to be merely a question of the fair division of the cost of carrying a heavy stock of pitch, so far as the tar distiller's case is put; and, admitting for the moment that it is made out, this would be effected by his paying half an agreed minimum value for the pitch.

With regard to the last clause, I would like to point out that the tar distillers, who singly and collectively are generally quite alive to their own interests, have really raised this question by their action in trying to get gas companies to take over part of their business.

EQUITY.

Oct. 15, 1914.

Use of Coke-Oven Gas for Town Purposes.

SIR,—Referring to your article in the "JOURNAL" of Oct. 13, you will be interested to learn that all the difficulties in the way of the supply of coke oven gas to the Middlesbrough Corporation have been overcome.

I had the pleasure to-day, as Chairman of the Gas Committee of the Corporation, of turning the valve which liberated the gas into our mains to be conveyed to the purifiers. The gas can now be supplied at the rate of more than a million cubic feet per day; and the connection has been made without the slightest hitch.

JOS. CALVERT, Chairman of the
Middlesbrough Gas and Electricity Committee.

Park View, Middlesbrough, Oct. 15, 1914.

Lubrication of Machinery.

SIR,—I was very interested in the discussion of the topic of lubrication by "Modus Operandi" in your last issue, and would be very grateful if he would deal with "Stauffer's Lubrication" while on the subject.

The following incident recently occurred, and is not satisfactorily explained. The whole of our line-shafting was overhauled in May of this year; a portion was renewed, and several new brass bearings were supplied. Other bearings were levelled-up with white metal. Needle lubricators were discarded; and Stauffer's Type B "Tell-Tale" lubricators were substituted. The main shaft had three equidistant bearings, and two loose pulleys; and it revolved at 120 revolutions per minute. The countershaft driving the pumps and scrubber revolves at forty revolutions per minute, and has six bearings and two pump straps.

The latter shaft gave us very little trouble beyond suddenly burning-out the white metal of one bearing in June, which we were able to trace to bad alignment in refixing. The mainshaft, however, gave us no peace from the day of its fixing; the bearings never getting cold,

and many times being dangerously hot. We appeared to use quantities of grease, and the three grades tried, and even some graphite grease. The bearings were slacked, and we never dared to have them properly tightened.

The adjusting screw of the lubricator was constantly cleaned and set in all positions. Plenty of grease got through, but did not appear to reach the shafting through the brasses.

For some time this was endured, under the impression that the bearings would gradually cool as the shaft seated itself.

The firm of engineers who did the work were consulted as to replacing the needle lubricators; but they gave us no encouragement, and opined that our belts were too tight.

A few weeks ago, we decided to try-back the needle lubricators, and found (to our great relief) that the bearings cooled within two hours; and they have remained absolutely cold ever since.

Why did the "Stauffer" fail to properly lubricate on the shaft-bearings? Yet on the pump straps and loose pulleys, which are in direct contact, they answer well.

T. W.

Oct. 16, 1914.

Lighting and Extinguishing Gas-Lamps.

SIR,—On p. 87 of the issue of the "JOURNAL" dated Oct. 13, there is a report in connection with the recent meeting of the East Midland District of the Institution of Municipal and County Engineers at Hinckley.

The President asked particulars as to how the process for lighting and extinguishing the gas-lamps was conducted in Hinckley; and Mr. Lee, the Engineer, Secretary, and Manager of the gas-works at Hinckley, explained how the system was worked and how he was satisfied with it. Mr. T. W. Haywood, of Battersea, said that he had twenty miles of streets lighted in this way, and proceeded to show how unsatisfactory the system was. The lamps in Hinckley are controlled by the "A. and M." apparatus for lighting and extinguishing. We do not know what is used in Battersea; but it is certainly not the "A. and M." apparatus. In the circumstances, you can see that Mr. Haywood's remarks might be mistakenly read as a disparagement of the "A. and M." apparatus, as it works in Hinckley.

Wherever the "A. and M." apparatus is working (and there are a great number of places), no such experience as Mr. Haywood, of Battersea, mentioned can be found.

ALDER AND MACKAY.

New Grange Works, Edinburgh, Oct. 15, 1914.

REGISTER OF PATENTS.

Treatment of Coal Tar for the Removal of Properties Tending to Induce Pitch Cancer.

ROBINSON, H. W., of Sedgley, Staffs.

No. 20,767; Sept. 15, 1913.

In patent No. 4158 of 1913 are described some methods of treating coal tar and its products for the purpose of eliminating the properties in it which tend to induce pitch cancer; the process described consisting essentially in the treatment of the tar or pitch with formaldehyde or other suitable aldehydes. It was found that by this process pitch and oils were obtained from which either the auxetics or kinetics had been removed; and experiments had shown that, without the presence of such auxetics and kinetics together, the products would not be in a condition to stimulate pitch cancer.

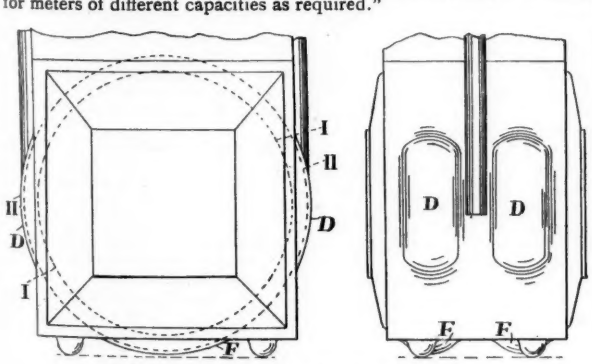
According to the present invention, a similar result is obtained by treating the coal tar at a suitable stage (either before or during distillation) with ozonized air. The air may be ozonized by any suitable electrical apparatus; and it is then blown through the tar by means of perforated pipes which can be fitted in, or lowered into, the vessels containing the tar. The ozonized air may be blown in alone, or else together with steam.

Gas-Meters.

FOX, T., and JAMES MILNE AND SON, LIMITED, of Edinburgh.

No. 27,411; Nov. 28, 1913.

In their specification, the patentees remark that, in dry gas-meters as at present constructed, "the casings are made in standard sizes, and are adapted for use with standard diaphragms of corresponding sizes;" but under their present invention the meter casing is so made that diaphragms of different sizes may be used—"the casing may be utilized for meters of different capacities as required."



Fox's (Milne and Son) Dry Meter Cases.

A front view of a meter, with the upper portion broken away, and a side view of same, are shown.

The back and front walls are of the usual form, and the sides are each made with a pair of excrescences or dished-out portions D, while the bottom of the meter is provided with a pair of similar excrescences or dished-out portions F in line with the portions D.

When the meter is in use with the larger-capacity diaphragms, the leather sides extend into the recesses in the meter sides and bottom each time the diaphragms are collapsed. The dotted circle I. represents the collapsed position of the smaller capacity diaphragms, while II. represents the same position for the larger-capacity diaphragms.

Gas-Heater for Buildings.

HOLMES, W. W., and CONNER, W. J., of Los Angeles, California.

No. 34; Jan. 1, 1914.

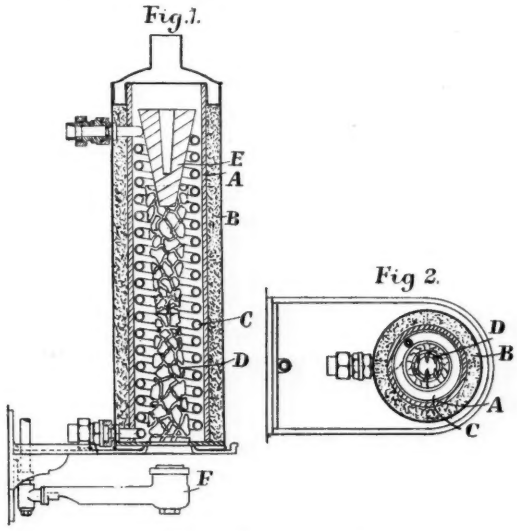
This invention relates to gas-heaters adapted to be placed in the floors or walls of buildings in order to heat the various rooms. The heater consists of: An inner casing open at the top and bottom; a fire-box mounted in the lower end of the casing; a heating drum, also mounted in the inner casing, to contain the products of combustion, and provide greater heating surfaces; and an outer casing closed at the sides and bottom, and open at the top, whereby air to be heated will be directed between the casings, and will pass beneath, and entirely around, the fire-box before passing out at the upper open end of the heater—the draught inlet and outlet for the fire-box passing through one wall of the casing. Means are provided for supplying the air required for combustion from a source outside the room, directly into the combustion chamber; to provide greater heating surfaces, and to cause the products of combustion to flow upwards and downwards within a heating drum; and to draw off the products of combustion near the bottom of the casings and deliver them to a point outside the room.

Liquid Heaters Heated by Gas.

SHARP, W. Y., of Glasgow.

No. 3132; Feb. 6, 1914.

This invention relates to liquid heaters in which the liquid is caused to circulate through a tank and also through a coil located in a container lined with non-conductive material and subjected to the heat of a gas-burner. Refractory material is inserted within the coil and a fire-clay cone is arranged on the top in such manner that the hot gases from the burner are prevented from passing directly through the container and are diverted towards the coil and between its convolutions, "so that very little heat is wasted."



Sharp's Gas Liquid Heater.

The container, as shown, has a removable cover, with an outlet above, which may be placed in communication with a suitable flue. The container is also provided with an inner wall or cylinder of asbestos A, so located as to leave a surrounding space into which silicate cotton B, or other non-conductive material, is packed, and the bottom is lined with asbestos. A hollow coil C (preferably copper) is positioned within the inner wall. The ends of the coil pass through apertures in the wall and the container, and are so connected with a water-tank that the liquid can circulate freely through the coil and tank or receptacle. Asbestos, fire-clay, or other refractory material, preferably in the form of "fuels" D (such as are generally used in gas-fires), is placed within the coil; the "fuels" being preferably tapered and arranged as shown, while an inverted cone E, of fire-clay material, is arranged on the top. The hot gases from the burner F are directed, by the "fuels" and fire-clay cone, towards the coil and between its convolutions, so that the liquid is "rapidly heated and soon begins to circulate."

Gas-Driven Pumps.

TOOLEY, H., of Buckhurst Hill, Essex.

No. 2949; July 5, 1914.

This invention relates to pumps in which an explosive mixture is ignited in a combustion chamber so as to give momentum to the liquid to be pumped, and which momentum is employed in completing the cycle of operations; the chief object aimed at being "to provide

improvements in the means employed for effecting the compression of the combustible charge."

According to one part of the invention the combustion chamber, or an extension of it, is provided with a piston made in two parts forming a non-return valve. One part of the piston (connected to a piston rod) is arranged to move beyond the other part so that the piston towards the end of its stroke opens to allow liquid to pass. Two suction pipes, with valves, admit liquid to the spaces on each side of the piston. Various means for operating the piston may be applied—such as a fly-wheel and suitably proportioned cam mechanism for storing energy on the outward stroke and returning it to the piston on the inward or suction stroke. Or a spring and pawl or trip device may be used, either of simple form or comprising a pair of rods or arms with springs, arranged to form a toggle-joint and expanded against the pressure of the springs on the outward stroke. One of the suction valves may be employed to release the spring mechanism for the return movement of the piston.

The piston is preferably used in conjunction with apparatus referred to in patent No. 7273 of 1913, comprising a charge-vessel communicating above and below with the combustion chamber, and so arranged that a combustible charge is drawn into it by the outflow of liquid from its lower end into the combustion chamber, and is delivered into the chamber from the upper end of the vessel by the inflow of liquid from the chamber through the lower end of the vessel.

The action of the apparatus is as follows: Starting with the pump supplied with liquid and having its combustible charge compressed above the liquid in the combustion chamber, the charge is ignited, driving down the liquid and piston until the latter nears the end of its stroke, when the valve opens and the liquid above it continues to flow through into the delivery pipe until the pressure falls to just below atmospheric. At this point the piston-valve closes, and the liquid in the charge vessel is drawn into the combustion chamber, cooling the hot gases and further reducing the pressure, while a fresh combustible charge is drawn into the charge vessel. Fresh liquid is drawn in through the suction pipe opening above the valve, discharging the products of combustion through an exhaust valve. On the closed piston rising under pressure due to the power stored on its outstroke, the charge is compressed and is changed over from the charge vessel to the combustion chamber. The lower suction pipe supplies liquid to the space below the piston as the latter rises.

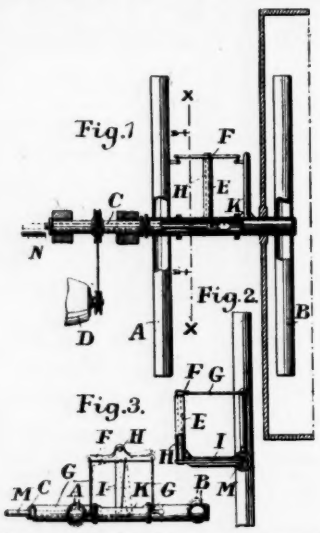
Other particulars of the working, and a series of detailed lettered drawings, accompany the specification.

Determining the Density of Gases.

BOMHARD, K., of Charlottenburg, and KÖNIG, G., of Berlin-Südende, Germany.

No. 4628; Feb. 23, 1914. Convention date, Feb. 22, 1913.

According to this invention, the density of a gas is determined by measuring the resistance encountered by a body when moving in an enclosed volume of the gas the density of which is to be determined; and one mode of carrying the invention into effect is illustrated.



Bomhard and Konig's Gas Density Apparatus.

Fig. 1 is an elevation (partly in section) of the apparatus; fig. 2 is a transverse section on the line X looking in the direction of the arrows; fig. 3 is a detail plan view.

The apparatus comprises two tubes A B freely mounted upon a hollow shaft C so as to be easily rotated. The member A rotates in air at atmospheric pressure; while B rotates in an atmosphere of the gas the density of which is to be determined. The shaft C, when driven by a motor D, transmits movement to both members A B by a hollow cranked or angular member E, rigidly connected with the shaft and carrying at its upper end a pivoted balancing beam or lever F. The ends of this beam are connected with A and B by rods G, so that, upon rotation of the shaft C in one direction, both members are rotated in the same direction.

When the density of the gas in which B moves differs from that of the atmosphere in which A moves, then obviously B (owing to the difference in the resistance which it has to overcome) will remain behind or hasten in advance with respect to A, and the eccentrically pivoted beam F will be rotated (fig. 3) until the moments exerted by the connecting rods G in driving A and B become balanced.

This angular displacement of B with respect to A is therefore measured by the movement of the beam F, which is keyed upon a rod H carrying at its lower end a lever I. This lever extends into the shaft C through a slot K; and when the beam F is rotated, it moves an index rod M arranged within the shaft C, and the movement can be read off from the scale N.

Metal Covering for Prismatic Shades.

HOLOPHANE, LIMITED, of Westminster, and MYGATT, O. A.

No. 4677; Feb. 23, 1914.

In factories, where glass shades are exposed to the danger of being destroyed by blows, it becomes needful to protect the shades, and, moreover, in workshops where the shades may become rapidly covered on their outer surface by dust, the patentees propose to add to their well-known glass prismatic shade an outer covering of metal, preferably of a white metal itself possessed of a reflecting surface. The metal is applied in a thin layer or sheet, preferably by "spinning," and is as closely applied to the outer surface of the shade as possible, "while retaining on the outside of the metal shade a perfectly smooth and continuous surface." At the lower edge of the shade, the metal is spun over the rim of the glass shade, so as completely to enclose and hold it.

Gas-Burners.

HALL, ISAAC, of Birmingham.

No. 5000; Feb. 26, 1914.

This invention relates to atmospheric gas-burners—especially to the construction and disposition of burners for the heating of metal pots in metal melting furnaces of the type described in patent No. 21,072 of 1912, and Nos. 11,843, 15,323, and 21,158 of 1913.

According to the present invention, a group of five or more burners is fed from a single pipe; the gas being divided and subdivided by means of branches, each leading to an intermediate point between two subsequent branches. In this manner it is said to be possible to "ensure that the gas is not fed directly opposite any particular branch or burner or burners, but that the pressure upon the different burners is distributed." The invention also comprises other features regarding the construction of such burners and their arrangement; but these are not described apart from the detailed lettered drawings.

Gas-Heated Wash-Boilers.

TOWNSEND, H., JUN., of Wakefield, and WILSON, J. W., of Armley, near Leeds.

No. 7036; March 20, 1914.

The boiler here referred to is provided with an interior pipe dipping nearly to the bottom, and passing through the wall of it at a point adjacent to the top, but below the top water level. From this point the pipe bends downwards, and is provided with a tap at about the lower outer end (which will be at or below the bottom of the boiler), to which a connecting pipe may be attached, or the pipe may dip into the bath itself. After the water in the boiler has been heated to the required temperature (the water standing in the boiler above the level of the outlet), "the boiler may be emptied by the mere turning on of the tap." The tap may be turned off and the syphonic action will recommence as soon as the tap is again turned on—that is, where the tap is placed on the delivery pipe towards the top.

Apparatus for Washing Gases and for Analogous Purposes.

DAVIDSON, W. B., of Birmingham, and LIVERSEDGE, A. J., of Croydon.

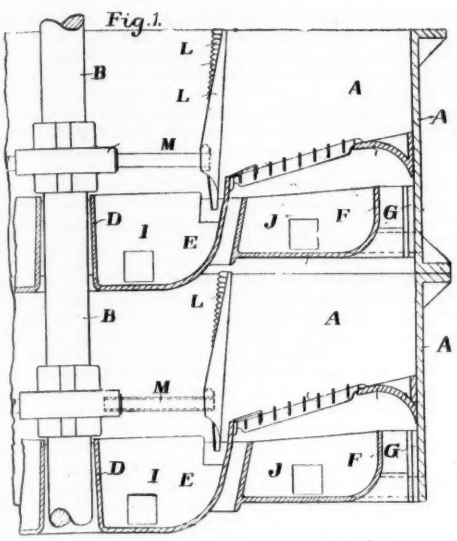
No. 9302; April 15, 1914.

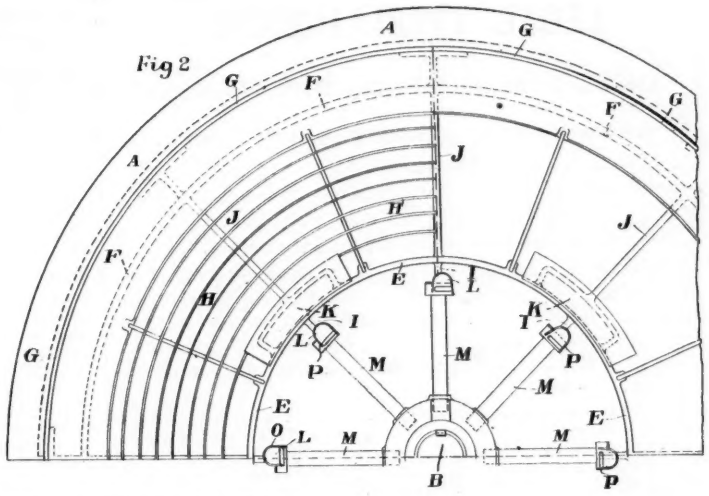
This invention relates to the washing of gases or "for bringing liquids and gases into intimate contact for other analogous purposes." It is of the class of centrifugal spraying apparatus having side gas-passages with the object of providing an "improved apparatus in which a very effective spray is obtained giving an increased depth of spray, so that the space through which the gas has to pass, exposed to the spray, is considerably increased."

The chambers in which spraying takes place have gas-passages at or near the sides beyond the liquid-spraying member; and the latter comprises a number of upright or inclined vanes projecting from a rotary shaft so as to be clearly separated from each other—the vanes having liquid raising portions below the arms formed integral with, or secured to, the vanes. It is preferred to arrange a gallery of concentric vertical rings spaced apart between the gas-passage and the spraying vanes; such rings forming baffles for the spray but offering no obstruction to the passage of the gas.

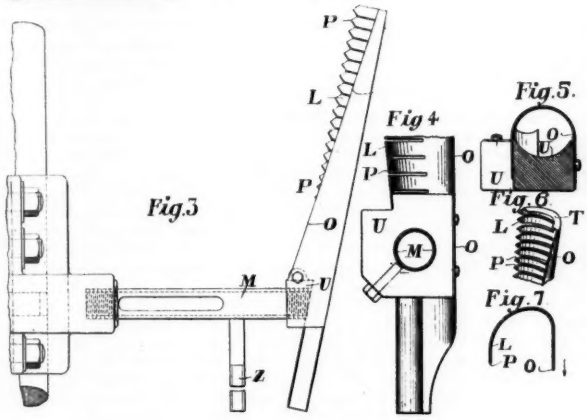
Fig. 1 is a section of two superposed washing chambers. Fig. 2 is a plan. At the right-hand side it shows the baffles for preventing spray entering the gas-passage removed. Fig. 3 shows one of the spraying vanes and supporting arm (to a larger scale) and the method of increasing the liquid raising capacity. Fig. 4 is a view of the vane at right angles to fig. 3 looking in the direction of the arrow. Fig. 5 is a cross section of fig. 4. Fig. 6 is a perspective view of the upper end of a vane. Fig. 7 is another cross section of fig. 4.

A is one of the washing chambers, any number of which may be placed one upon the other on a suitable base. B is a rotary shaft mounted in bearings and driven by any suitable means. The bottom of each chamber consists of a raised central circular wall D, which when in position surrounds the shaft. A second wall E bounds the main well part of the chamber for the liquid; and a further wall F forms one side of the gas-passage. An outer wall G, for attachment to the casing, is connected to the casing by radial webs, which at





Davidson and Liversedge's Gas-Washer.



intervals cross the gas-passage. They are preferably in line with radial walls I, which form breakwaters to prevent undue motion of the mass of liquid within the main well part; while the radial walls J serve the same purpose in the remaining portion of the bottom plate. Beyond the wall E overflow passages K for the liquid are arranged; the walls I and J being separated by these passages.

The spraying vanes L, mounted by the arms M to collars secured on the rotary shaft, are formed of sheet metal, preferably troughed. As shown, the forward edge O of each vane (assuming clockwise rotation) tapers toward the top; while the rear edge P has practically the same projection from the back of the trough all the way to the top. This rear edge is preferably slit and saw-cut or serrated. The vane is preferably provided with an inturned flange T of width such as to prevent the liquid being thrown off in sheets at the top. The vane is secured to a block U by studs or pins; preferably integral with the vanes are the projections (below the block), which are troughed to form liquid raising scoops.

The arms M may be tubular, and openings or slots Y may be formed in their front walls (having regard to the direction of rotation) so as to take up liquid splashed up from the well by the rotating scoops, and under centrifugal action deliver it to feed the spraying vanes. If found desirable, additional scoops Z may be provided for this purpose, leading the liquid into the tubular arms M and thence to the spraying vanes L.

The vanes L and the overflows K are arranged so that liquid overflowing from an upper to a lower chamber passes down in a line behind, or within the path of, the rotating vanes, as shown at fig. 1. To prevent the waves from the main body of liquid passing into the overflows, the openings K are guarded by plates or shields, supported at their outer edges by the gallery of protecting baffle-plates or rings, which are employed to prevent the liquid from the sprayer passing into the gas-passages. This gallery is clearly shown at figs. 1 and 2. Over the gas-passages formed by the annular walls F G is provided an overhanging deflector C, which prevents liquid drops which are falling vertically—for instance, drops rebounding from the outer wall of the chamber A—from entering the gas-passage. The gallery of baffles is composed of vertical or slightly inclined strips or rings inserted in notches in radial bearer bars, which are dropped into recesses formed on the wall E and into other recesses formed between lugs in the deflector C. The inclination of the bearer bars raises the rings—in a tier or gallery; so that, while not preventing the free passage of the gas or liquid up and down, they form an efficient barrier to liquid drops thrown outward and downward by the sprayer.

In use, the liquid is supplied to the various chambers, and the gas passes upwards through the passage around the side. The shaft is rotated rapidly; and as the arms rotate, the downwardly projecting parts of the vanes are carried round in the liquid, which rises rapidly up the interior of the vanes and is thrown off under centrifugal force in a fine spray from its rear edge. The area of the chambers from the spraying vanes to the outer walls is completely occupied by this spray, through which the gas has to pass. Owing to the use of the vanes mounted on the arms M, and owing to the absence of a central gas-passage, the vanes may be mounted low in the chamber, and extend practically to the top; so that a large depth of spray is obtained. Further, owing to the vanes having liquid raising means immediately beneath them, the vanes may, it is pointed out, be mounted nearer to the shaft than spraying devices comprising discs, trays, or the like with perforated margins, and therefore "an increased width of spray is obtained before the outer wall is reached."

The patentees close their lengthy specification in these words: Owing to the side gas-passages, there is much less tendency to set up back-pressure on the gas than with central passages arranged beneath moving sprayers where the gas is exposed to the waves caused by the surging of the liquid. Further, owing to the gallery for preventing liquid entering the side gas-passages not obstructing the flow of the gas, or causing sudden changes of direction, there is less liability of back-pressure on the gas in our improved apparatus than in known apparatus using side passages. Few spraying vanes are found to be necessary—eight give satisfactory results in a washer 6 feet in diameter. With the vanes mounted on arms, the load on the shaft is considerably reduced. If desired, the vanes may be staggered so that there is no liability for their liquid-raising parts to set up cavitation in the liquid at high speeds. Or with this object, adjacent vanes may be set at different angles. In addition to preventing liquid entering the gas-passages, the gallery of baffles—particularly if close together, with liquid trickling down them—form admirable washing or scrubbing surfaces for the gas passing them.

APPLICATIONS TO AVOID OR SUSPEND PATENTS OR LICENCES OF ALIEN ENEMIES.

23,675 of 1904.—Grantee: BLAU, "Illuminating gas." Applicant: J. B. CHASSEAUD.

2292 of 1909.—Grantee: BLAU, "Illuminating gas." Applicant: J. B. CHASSEAUD.

18,936 of 1911.—Grantee: BLAUGAS PATENT G. M.B H., "Illuminating gas." Applicant: J. B. CHASSEAUD.

APPLICATIONS FOR LETTERS PATENT.

20,535.—STEWART, A. W., "Pipe-joint." Oct. 5.

20,538.—DAVIS, H. N., and TWIGG, W. R., "Bunsen burners." Oct. 5.

20,553.—WRIGHT, A. C., and FROST, A. C., "Actuating valves at predetermined times." Oct. 5.

20,555.—BROWN, E. W., "Gas-igniting apparatus." Oct. 5.

20,594.—FAIRWEATHER, W., J., & W. R., "Gas-bags of engines." Oct. 6.

20,616.—JOHNSON, J. Y., "Separation of carbon monoxide from gas mixtures." A communication from the Badische Anilin und Soda Fabrik. Oct. 6.

20,793.—CLARK, A., and WHITWORTH, H., "Meter." Oct. 9.

20,795.—SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., "Gas-irons." Oct. 9.

20,824.—BRITISH UNITED SHOE MACHINERY COMPANY, "Gas-burners." A communication from the United Shoe Machinery Company. Oct. 10.

20,827.—GLASGOW, A. G., "Transforming the light of artificial illuminants." A communication from E. J. Brady. Oct. 10.

Water Supply in West Kent.—A report was received at a recent meeting of the Bexley Heath Urban District Council from Mr. C. E. Baker, representative of the Kent district on the Metropolitan Water Board, as to the work it is proposed to carry out to improve the water supply to Kent. It was stated that the matter had been discussed by a Committee, and, subject to the approval of the Board, work involving an expenditure of £155,000 would be put in hand as soon as the necessary powers could be obtained. The Engineers were preparing a report as to works for a supplemental supply for Kent from the River Thames. These works were necessitated by the rapid growth of population in the Kent area.

LEGAL INTELLIGENCE.

LIABILITY FOR REINSTATEMENT OF PAVEMENT.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Oct. 13.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* KENNEDY *and* SWINFEN EADY.)

Brame and Clark v. Commercial Gas Company.

This was an application on behalf of defendants to extend the time for appealing from a judgment of the Divisional Court [reported in the "JOURNAL" for July 28, p. 232] supporting the judgment of Judge Smyly at the Bow County Court awarding plaintiffs £35 and £30 respectively in respect of damages caused through tripping over uneven pavement.

Mr. MACMORRAN, K.C., explained that the case raised the important question whether the Borough Council, and not the Gas Company, were liable; and as the Company considered the point was one of vital importance to them, they were willing to pay the whole of the costs of the appeal, whatever might be the result.

Their LORDSHIPS dismissed the application, considering that there was no ground for enlarging the time, especially as there had already been two hearings—one in the County Court and one in the Divisional Court—in both of which defendants had been unsuccessful.

It may be remembered that the case referred to (as reported in the "JOURNAL" at the time of the hearing) was one in which the Commercial Gas Company were laying a main or pipe in Canton Street, Poplar, under the Gas-Works Clauses Act, which is incorporated in the Special Act of the Company. The Company are, of course, bound to reinstate and make good the pavement of the street after they have laid the pipe; and they are bound under the same Statute to keep the surface of the street in repair for a period of twelve months after they have made good the street in the first instance. But in the Metropolis there is a section of an Act of Parliament which says that the local authority (which in this case was the Borough Council), instead of allowing the Company to make good the pavement, may themselves fill in the trench, and do all the work of making good, and require the Company to pay them the cost of so doing. In this case the Company had laid their pipe in the street in sections; and as each section was completed they gave notice of the part to the Borough Council, and the Council proceeded to make good the street in each section as it was completed. In the particular section in which the accident occurred, the work was completed on July 28 (the work was commenced two days previously), and notice was given to the Borough Council the same day that the trench of the street was ready to be made good. The Borough Council gave notice to their inspector on the same day to proceed with the work. It so happened that the Council were working a little way behind in the same street at the time; and the accident sued upon happened between the time when the inspector had notice to make good the street and the time when the Borough Council's men came up to the spot. Between the date of the completion of the work by the Company and the accident, the Company's workmen had come along on several occasions and put right some stones that appeared to be loose or defective; and from this circumstance it was inferred that there was an arrangement between the Company and the Council that the Company were to look after things until the Council took the matter in hand. There was, however, no evidence whatever of any such arrangement. All that happened was that a man went along, and if he saw a stone was loose he put it right. It was a mere voluntary act on his part, and he really had no power or authority to interfere with the street after the Council had taken it over or had undertaken to do the work. The importance of the case to the Company is that, after they had an intimation from the Council that they were going to do the necessary work, they had no power to interfere with the street—they must leave it as it was. Counsel for the Company submitted that it was the duty of the Gas Company to look after the street in every shape or form until the Borough Council actually got up to the work. It was, he contended, a somewhat important matter generally. The usually accepted view was (and the authority to which he referred bore it out) that after the Borough Council had undertaken to do the work, the Company not only need not, but may not, interfere with the street at all—they have no duty in respect of it. This was the question that the Court decided against the Company—that there is a duty on the part of the Company to continue to look after the street.

WATER SUPPLY FOR "DOMESTIC PURPOSES."

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Oct. 16.

(*Before Mr. Justice* SARGANT.)

Oddenino v. Metropolitan Water Board.

This case, which it is understood is a test case, was really the sequel to the decision of the House of Lords in *Metropolitan Water Board v. Avery*, and raised the much-debated question of what is a supply of water for "domestic purposes." Plaintiff, who is the occupier of a house or building at Nos. 60 and 62, Regent Street, known as the "Imperial Restaurant," requested defendants in February last to furnish him with a supply of water for domestic purposes, in accordance with the provisions of section 8 of the Act of 1907. Defendants refused to supply except by meter, alleging that the water was used for trade or manufacturing purposes, and that the supply should be under section 20. By counterclaim, the defendants sought a declaration that they were not bound to supply water except by measure. On their behalf, evidence was given that the water was used for a steam-boiler, for automatic flushing tanks, for washing vegetables consumed in the restaurant, and also for feeding a trout-tank. It was also said that only the manager and housekeeper slept on the premises.

Mr. RYDE, K.C., and Mr. COURTHOPE MUNRO, K.C., appeared for the plaintiff; Mr. ROMER, K.C., and Mr. GOODLAND for the defendants.

Mr. Justice SARGANT, in giving judgment, said the question (which was one of considerable importance, as it affected a large number of cases) really turned on the construction of four sections of the Metropolitan Water Board (Charges) Act, 1907—sections 8, 16, 20, and 25. By section 8 the Board were put under an obligation to supply water for domestic purposes at a charge based on the rateable value of the premises—at a flat-rate—irrespective of the amount of water consumed. By section 16, they were compelled to give a supply of water for non-domestic purposes by means of a meter at a charge based on the amount of water consumed. By section 20 (which was really the most important section) they were relieved from the obligation of affording a supply of water, otherwise than by meter, to any house where any part was used for any trade or manufacturing purpose for which water was used. Section 25 was stated to be a defining section; but it did not go to that length. It might have been intended to indicate what were domestic purposes; but even in this small object it appeared not to have entirely succeeded. It seemed to be quite clear that the water supply taken by the plaintiff had, in the words of Lord Atkinson in *Metropolitan Water Board v. Avery*, "been supplied and used directly in and for the business." It had been used for the various purposes for which the business was carried on; and in view of this fact he should have thought, apart from the authorities, that the terms of section 20 had obviously been brought into play. The house or building was being used for a trade purpose for which water was needed; and this being so, the Board were *primâ facie* entitled, on the obvious construction of the section, to refuse a supply otherwise than by meter. The claim of the plaintiff had originated from the decision given by the House of Lords in *Metropolitan Water Board v. Avery*. The net effect of the decision had been to put an interpretation on the words "domestic purpose" as used in section 8; but it had not put any interpretation on the words in sections 20 or 25. Where the language of an Act was reasonably clear with regard to the material section, he objected to the introduction of confusion by reference to a decision on an altogether different section of the Act which various judges had said was an ill-drafted and confusing section. And, unless he was bound to do so by the force of the decision, he did not feel disposed to alter the construction which he thought should be put on the fairly-plain words of the section. When one considered the case of *Metropolitan Water Board v. Avery*, the real effect of the decision was this—that when water was both being supplied for "domestic purposes" and also for "trade or business," the fact that it was supplied for domestic purpose was of more importance than the fact that it was being used in a trade or business. The words "manufacture or business" in section 25 did not define the expression "domestic purpose;" but it constituted a warning note to provide against an undue inflation of the term "domestic purpose." A person might be carrying on in his own house a trade or business in the ordinary sense, and he might be taking a supply of water for purposes which were clearly not domestic in the ordinary sense of the word; and in such a case, under the warning note in the section, it could not be said the supply was a supply for "domestic purposes" because a "trade, manufacture, or business" was carried on in the house. However that might be, he could not find that the effect of the section was in any way to put a definition for the purposes of the other sections of the Act on the word "trade" or "manufacture." The net result merely was that where, as Lord Atkinson put it, water was supplied directly in and for the business, yet nevertheless if the business was one where the use of the water was for domestic purpose, that use was covered by the flat-rate payment under section 8. Lord Justice Buckley put it very clearly that the test was the purpose for which the water was being used—not the character of the building in which the water was being used. In his Lordship's judgment, the test indicated by section 20 was precisely the contrary to that in sections 8 and 25. The test was the character of the house to which the water was being supplied—not the purpose to which the water was actually being put. It was quite clear that section 20 did not fit in to any particular space left by sections 8 or 16. These sections covered all the ground, and the effect of section 20 was to limit the obligation of the Water Board within a certain area; and the only question to be determined was, What was the extent of this area? Mr. Ryde had suggested that the section would have to be read in the same way as if it had provided that the exemption of the Board extended only to any house or building whereof any part was used for any trade or manufacturing purpose for which a non-domestic supply of water was used or for which water was used non-domestically. He (his Lordship) did not see why any such words should be introduced. Under section 8 persons were entitled to a supply for domestic purposes at a flat-rate; it being thought that the amount taken for domestic purposes was more or less in proportion to the size or value of the house. In the case of non-domestic purposes, where it was impossible to say what would be the amount of water consumed, the supply had to be given (under section 16) by meter. It must have been present to the mind of the framer of the Act that there might be many cases in which a house, or part of a house, was being used for trade or manufacturing purposes, and in which nevertheless a supply of water might be wanted for domestic purposes; and whether to guard against the danger which Mr. Ryde had suggested, of the use of water supplied for domestic purposes or non-domestic purposes, or whether recognizing that although domestic purposes might be the only purpose to which the water was put, still if these domestic purposes were fulfilled in the course of carrying on a trade or business—such as a restaurant, or the supply of baths for reward—then, in that case, inasmuch as the use of the water would not necessarily be in proportion to the rateable value of the premises, the Board might say they would only supply by meter. He (Mr. Justice Sargant) could find nothing in the judgment of the House of Lords or of any of the inferior Courts in *Metropolitan Water Board v. Avery* which enabled him

to limit the *primâ facie* meaning of the words used in section 20. He must, therefore, hold that, according to the true interpretation of the section, plaintiff was not entitled to a supply of water for domestic purposes otherwise than by meter. In using the phrase "domestic purposes," he (his Lordship) had in mind the fact that at the present time plaintiff was taking water for one or two purposes—such as flushing urinals and feeding a trout-tank—which could not be described as "domestic purposes," and this being so, even on Mr. Ryde's interpretation of section 20—the defendants were entitled to charge by meter so long as the present system of supply continued. The parties were not desirous that this short cut should be taken to terminate the case; and so it was settled that if the decision had been the other way the arrangement should be altered so that the supply henceforth should be only for domestic purpose as interpreted in *Metropolitan Water Board v. Avery*. For the purpose of the present decision, his Lordship said he had dealt with the case as if the supply had been throughout a supply for domestic purposes only. There would be a declaration that the defendants were not bound to give a supply for domestic purposes except by meter, so long as any part of the premises were used for trade or manufacturing purposes. Plaintiff must pay the costs.

CHARGE AGAINST A GAS-WORKER'S UNION OFFICIAL.

The Ilkeston Magistrates had before them last Thursday a case in which Thomas Pounder, a member of the Town Council and until recently Secretary of a local branch of the Gas Workers and General Labourers' Union, was charged with forging a quarterly balance-sheet relating to the funds of the Union. The proceedings had been instituted, by authority of the Executive, by Mr. Arthur Hayday, of Nottingham, the Secretary of the district branch.

Mr. A. E. Hopkins, who appeared for the prosecution, explained accused's duties and stated that lately his books seemed to have been utterly neglected. The last date for which contributions had been entered was June, 1913; and obviously it would be quite impossible to prepare a correct balance-sheet from blank pages. A balance-sheet had been sent in, purporting to have been signed by the Chairman and two Auditors; but these signatures were forgeries. There was a false entry in the balance-sheet also as to the number of members; the figures given being 554, whereas there were 631 members.

Mr. *Arthur Hayday* gave evidence in support of the opening statement, explaining that defendant had been Secretary of the Ilkeston No. 1 branch of the Union for twelve years. It was his duty to render to witness a weekly return of the contributions paid in and to prepare a balance-sheet quarterly for the purpose of audit. No balance-sheet had been received for the quarter ended June last. The previous quarter ended on March 28; and a balance-sheet had been furnished for that period. On July 3, defendant gave a month's notice of his intention to relinquish office; and he was summoned to a special district Executive meeting on July 11, but failed to attend. Upon obtaining defendant's books, it was found that there was no complete set of entries since September, 1912.

In cross-examination by Mr. F. G. Robinson, who appeared for the defence, witness admitted that he had received from defendant all the money which he had been able to ascertain was due from him. He had been informed that some members had paid contributions, but had not been supplied with cards. Pounder received 10 per cent. of the total income from the branch. He had had a good deal of confidence in the defendant previously, and up to the present had found him to be a very straightforward man. He had received from Pounder all the amounts he had found to be owing.

Mr. *Edwin H. Palmer*, accused's successor, having given evidence,

Mr. *John Barker*, who was Chairman of the branch until June last, denied that the signatures which appeared on the balance-sheet for the March or December quarters last were his.

In cross-examination, he admitted that while he was Chairman for six quarters he signed only one balance-sheet. He complained to the defendant as to his failure to produce balance-sheets, but admitted that he did not report the matter to the Executive. Defendant used to tell him he had made it all right, and witness got his fee, although he did not sign the balance-sheets.

Mr. *Frederick Perkins* stated that he had never been appointed or acted as Auditor, and had never received an auditor's fee. He had never signed any balance-sheets.

Other similar evidence of denial as to the authenticity of signatures upon balance-sheets having been given,

Mr. *F. Smart*, a hand-writing expert, expressed the opinion that the signatures the genuineness of which had been repudiated, were in defendant's hand-writing.

Mr. Robinson, in defence, urged that forgery must be the signing of someone else's name with a fraudulent intent, which was not present in this case. There was no suggestion that the Society had been defrauded of a single penny by anything defendant had done.

Defendant, who pleaded not guilty and reserved his defence, was, after an exhaustive investigation, committed for trial at the next Derbyshire Assizes.

South Lincolnshire Water Company's Affairs.

Mr. Justice Warrington, sitting in the Chancery Division of the High Court of Justice last Wednesday, made an order for the payment of £120 1s. by Mr. Charles E. Baker, a former Solicitor of the South Lincolnshire Water Company, to the Receiver of the Company. Mr. Northcote (for the Receiver) said the money was paid by the Company to Mr. Baker in order to complete the purchase of a certain piece of land. The purchase was never completed by him, though it had been completed in another way. Mr. Swinney (on behalf of Mr. Baker) submitted that there was due at the time of the transaction in question a larger sum of money from the Company to Mr. Baker for costs, and that he was entitled to retain the sum in his hands in part discharge of the amount due to him. His Lordship said the money was entrusted to Mr. Baker for a particular purpose; and it had been decided by the Court of Appeal that it was impossible for him to set up any form of set-off or lien for the money which he held in trust for the Company. The defence failed, and there must be an order for the amount claimed, with costs.

Blackburn Gas-Stoker's Claim.

At the Blackburn County Court last Tuesday, a case was mentioned in which a Blackburn gas-stoker, named Duckworth, sought to recover compensation from the Corporation. Mr. H. Backhouse, who appeared for the Gas Workers and General Labourers' Union, stated that in March applicant was drawing a retort at the Greenbank Gas-Works, when he dislocated his right shoulder. It had been dislocated on other occasions; and the shoulder came out with very little exertion. The man recovered from the accident and returned to work, after which the Corporation informed him they could not continue to employ him, stating that the Insurance Company objected to his being engaged on this particular job, because of his proneness to dislocation of the shoulder. Mr. Backhouse acknowledged that there were difficulties in the way of proving his case; and, in the circumstances, he had decided to accept £45 and agreed costs. His Honour approved the settlement.

Water Used for Troop Washing not a Domestic Purpose.

At the Aldershot Police Court last Thursday, Henry W. Johnson was summoned by the Aldershot Gas, Water, and District Lighting Company for using domestic water for other purposes. An inspector in the service of the Company visited the premises on the 8th inst., and the defendant admitted that he was then washing for fifty men. It was stated by Mr. Norman Clinton, on behalf of the Company, that the number of troops in Aldershot had gone up from 25,000 to upwards of 100,000. The civilian population had also increased; and consequently the demand for water was unprecedented. There was plenty to cope with the supply; but it was essential that the Company should know what demand there would be, and in the absence of any notification of the use of water for other than domestic purposes, they had only to provide for what would be ordinary consumption. The Company's charge was one-third of a penny per head per week. They got little, if anything, out of it; but they wanted to know where this washing was being done, so that they might supervise it; and they therefore took the present proceedings so that everyone might know that where there was a supply for domestic purposes, it could not be used in connection with the business of troop washing. The Magistrates found that water used for the purpose in question was not a domestic supply, and imposed a fine of 5s.

Gas-Engine Driven Dynamos at Tottenham.

The works which are being erected by the Tottenham Light, Heat, and Power Company, from which electricity will be supplied to Wood Green, will be completed very shortly. Already gas-engines to drive the dynamos have been installed. These are of the most modern type. One is of 350-H.P. and the other 175 H.P.; and they are for the production of 200 and 100 kilowatts respectively. The engines are started by compressed air, the compressor being driven by an electric motor; but for the initial air compression, until electricity is available and the battery charged, a small gas-engine has been installed. The supply of gas to the large engines comes through a separate holder, to prevent the starting of the engines affecting the pressure at ordinary mains. The gas is measured by a wet meter capable of registering 20,000 cubic feet per hour. The gas-engines, used separately or together according to need, will be worked only during the afternoon and evening; the electricity supply at other times coming from a storage battery. The building in which the plant is contained embraces workshops, stores, and mess-rooms, and has been so designed as to be easily capable of extension. If it should be necessary, the total output could be more than doubled.

The London County Council Electricity Scheme.

Referring to this matter last Saturday, the "Surrey Comet" said: "If, regardless of the fact that the country is at war, the London County Council should persist in the contemplated application to Parliament next session for a mammoth electricity supply scheme for the whole of the Metropolitan area, it will be very ill-advised. Whatever the merits of the scheme, it should be obvious that the local authorities of Greater London can be in no mood to go very seriously into a scheme of such magnitude while the war lasts; and, moreover, in the absence of agreement, it would be a merely wanton act on the part of the London County Council to impose upon authorities owning their own electricity undertakings a parliamentary contest of great magnitude and costliness. The proposal, as we understand it, is that all electricity generating stations in the Greater London area should be co-ordinated, and placed under a central body constituted as is the Metropolitan Water Board. Huge generating works would be constructed on the Lower Thames, and existing generating stations used as distributing points. We have reason to know that the sites for the main generating works, which were selected before the outbreak of war, are considered, in the light of events now transpiring, to be strategically bad; and on this ground alone wise counsellors are suggesting delay. But the ground on which everyone is agreed that postponement is essential is, as already stated, the impossibility of concentrating upon such a scheme when the nation is waging war for its very existence, and when all the energies which our public men possess must be concentrated upon the single endeavour to prepare for any and every eventuality which may befall us as belligerents, and to meet every contingency, military or social, which a state of war entails."

MISCELLANEOUS NEWS.

GAS SERVICE RULES IN ILLINOIS.

The State Public Utilities Commission of Illinois have adopted a set of rules (which will come into operation on the 1st prox.) for establishing standards for gas and electricity service in the State. The rules were prepared by Mr. S. P. Farwell (the Chief of Service Department) and Mr. A. S. B. Little (the Gas Engineer), under the direction of Mr. R. M. Feustel (Chief Engineer of the Commission).

In the Illinois Public Utilities Act of 1913 (under which the rules have been made), the term "service" is used in its broadest and most inclusive sense, and includes not only the use or accommodation afforded consumers or patrons, but also any product or commodity furnished by any public utility and the plant, equipment, apparatus, appliances, property, and facilities employed by, or in connection with, any public utility in performing any service or in furnishing any product or commodity, and devoted to the purposes in which such public utility is engaged and to the use and accommodation of the public. The Commission have power to ascertain, determine, and fix for each kind of public utility suitable and convenient standard commercial units of service, product, or commodity, which units shall be lawful units for the purposes of this Act; to ascertain, determine, and fix adequate and serviceable standards for the measurement of quantity, quality, pressure, initial voltage, or other condition pertaining to the performing of its service or to the furnishing of its product or commodity by any public utility, and to prescribe reasonable regulations for examining, measuring, and testing such service, product, or commodity, and establish reasonable rules, regulations, specifications, and standards so as to secure the accuracy of all meters and appliances for examining, measuring, or testing such service, product, or commodity. These rules will apply to any public utility defined as such by the Illinois Public Utilities Commission Law which is now, or hereafter may be, engaged in the production, sale, or distribution of gas or electricity, and which comes under the jurisdiction of the Commission. The adoption of the rules will in no way preclude the Commission from altering or amending them in whole or in part, and the rules will in no way relieve any utility from any of its duties under the laws of the State. If any utility has been supplying, or is under contract to supply, a quality of service of greater value to the consumer than that which these rules require, no reduction in such quality of service shall be made by the utility before a determination by the Commission of the proper rate to be charged the consumer for the lower grade of service. Such a rate will, in general, be based upon the cost of furnishing the grade of service required by the rules.

The general service and special gas service rules will be of interest to "JOURNAL" readers; and it may be said that those governing the supply of electricity are equally comprehensive.

GENERAL SERVICE RULES.

RECORDS AND REPORTS.

All records required by these rules shall be preserved for at least three years after they are made. Such records shall be kept within the State at an office or offices of the utility located in the territory served by it, and shall be open for examination by the Commission or its representative. Each utility shall notify the Commission of the office or offices at which the various classes of records are kept, and shall file with the Commission such reports as the Commission may from time to time require.

TESTING FACILITIES.

(*a*) Each utility shall, unless specifically excused by the Commission, provide such laboratory, meter-testing shop, and other equipment and facilities as may be necessary to make the tests required by the rules or other orders of the Commission. The apparatus and equipment so provided shall be at all times available for the inspection or use of any member or authorized representative of the Commission.

(*b*) Each utility shall make such tests as are prescribed under these rules with such frequency, and in such manner and at such places, as may be approved by the Commission.

REQUEST TESTS.

Each utility furnishing metered service shall make a test of the accuracy of any meter upon written request by a consumer. Provided, first, that the meter in question has not been tested by the utility or by the Commission within six months previous to such request; and, second, that the consumer will agree to accept the result of the test made by the utility as determining the basis for settling the difference claimed. No charge shall be made to the consumer for any such test. A report of the result of every such test shall be made to the consumer.

ADJUSTMENT OF BILLS FOR METER ERROR.

If on any test of a service meter either by the utility or by the Commission, such meter shall be found to have a percentage of error greater than that allowed, the following provisions for the adjustment of bills shall be observed—

(*a*) *Fast Meters.*—If the meter is faster than allowable, the utility shall refund to the consumer a percentage of the amount of his bills for the six months previous to the test or for the time the meter was installed, not exceeding six months, corresponding to the percentage of error of the meter. No part of a minimum service or demand charge need be refunded.

(*b*) *Slow Meters.*—If the meter is found not to register or to run slow, the utility may render a bill to the consumer for the estimated consumption during the preceding six months, not covered by bills previously rendered; but such action shall be taken only in cases of substantial importance, where the utility is not at fault for allowing the incorrect meter to be in service.

RECORDS OF TESTS AND OF METERS.

(*a*) *Service Test Record.*—A complete record of the quality and condition of service shall be kept by each utility. The record so kept shall contain complete information concerning each test, including the date and hour when and the place where the test was made, the name of the inspector conducting the test, the result of the test, and such other information as may be required by the rules, or as the Commission may from time to time direct, or as the utility making the test may deem desirable.

(*b*) *Meter Test Record.*—Whenever any service meter is tested, the original test record shall be preserved, containing the information necessary for identifying the meter, the reason for making the test, the reading of the meter upon removal from service and the result of the test, together with all data taken as the time of the test in sufficiently complete form to permit the convenient checking of the methods employed and the calculations.

(*c*) *Meter Record.*—A record shall also be kept, numerically arranged, giving for each meter owned or used by any utility, the date of purchase, its identification, and the repairs and tests to which it has been subjected, with dates and general results of all tests.

(*d*) *Tabulation of Meter Tests.*—Monthly and annual tabulations of the results of all meter tests shall be made, arranged according to types of meters and intervals of test.

METER READINGS ON BILLS.

Bills rendered periodically to consumers for a metered service shall show the readings of the meter at the beginning and end of the period for which the bill is rendered, the number and kinds of units of service supplied, the dates of the meter readings, and the price per unit of service. On all bills which are computed on any other basis than a definite charge per unit of service, the other factors used in computing the bill shall be clearly stated, so that the amount may be readily computed from the information appearing upon the bill.

COMPLAINTS.

Each utility shall make a written acknowledgment to consumers of the receipt of all complaints; shall make a full and prompt investigation of all such complaints; and shall keep a record which shall show the name and address of the complainant, the date and nature of the complaint, and the adjustment or disposal thereof.

INTERRUPTIONS OF SERVICE.

Each utility shall make all reasonable efforts to eliminate interruptions of service, and when such interruptions occur shall endeavour to re-establish the service with the shortest possible delay. Whenever the service is interrupted for the purpose of working on the distribution system or the station equipment, this shall be done at a time which will cause the latest inconvenience to consumers; and those most seriously affected by such interruptions shall, if possible, be notified in advance.

SPECIAL GAS SERVICE RULES.

DEFINITION OF A CUBIC FOOT OF GAS.

For testing purposes, a cubic foot of gas shall be taken to be the amount of gas in a volume of one cubic foot when saturated with water vapour, at 60° Fahr., and at a pressure of 30 inches of mercury.

For purpose of measurement to a consumer, a cubic foot of gas shall be the amount of gas in a volume of one cubic foot under the conditions existing in such consumer's meter as and where installed; but provided consumers' meters shall not be set so close to any source of artificial heat as to subject them to a temperature exceeding 75° Fahr.

METER-TESTING EQUIPMENT.

Each utility furnishing metered gas service shall own an approved meter prover of not less than 5 cubic feet capacity, and shall maintain the same in proper adjustment to register the accuracy of the meters to within ½ per cent. The meter prover shall be so placed as to be shielded from excessive temperature variations, and shall be equipped with suitable thermometers and other necessary accessories.

The accuracy of all provers, and methods of operating same, may be established from time to time by a representative of the Commission. All alterations, accidents, or repairs which might affect the accuracy of a prover or the method of operating same shall be promptly reported in writing to the Commission.

GAS-METER ACCURACY.

(*a*) *Method of Testing.*—All tests to determine the accuracy of registration of a gas service meter shall be made with a suitable meter prover. At least two test runs shall be made on each meter, the results of which shall agree with each other within ½ per cent.

(*b*) *Installation Test.*—Every gas service meter, whether new, repaired, or removed from service for any cause, when installed for the use of any consumer, shall be in good order, and shall have been adjusted to be not more than 1 per cent. in error when passing gas at 6 cubic feet per hour per rated light capacity. Each such meter shall be marked by the utility testing it with the date of the last test made on that meter.

(*c*) *Allowable Error.*—Whenever a meter is tested to determine the accuracy with which it has been registering in service, it may be considered as correct if found not more than 2 per cent. in error, and no adjustment of charges shall be entailed unless the error is greater than this amount.

(*d*) *Prepayment Meters.*—No utility shall use prepayment meters geared or set so as to cause a rate or amount higher than would be paid if a standard meter was in use, unless the consent of the Commission is first obtained in writing.

PERIODIC TESTS OF GAS-METERS.

No gas service meter hereafter installed shall be allowed to remain in service more than five years from the time when last tested without being re-tested as specified in the rule on meter testing, and if necessary re-adjusted to be correct within 1 per cent. before being set for use.

During each period of twelve months after these rules take effect, until all meters now in service shall have been tested, each gas utility shall remove and test not less than 20 per cent. of all meters now in service; those longest in service being removed first.

REFEREE TESTS.

Upon written application to the Commission by a consumer, a test will be made of the consumer's meter, as soon as practicable, by an

inspector employed by the Commission. The application for such test shall be accompanied by a remittance of the amount fixed below as the fee for the test. If the meter is found to be more than 2 per cent. fast, this fee shall be paid to the consumer by the utility.

The fees for referee meter tests are:

Not exceeding 10 lights capacity, each	$2.00
Exceeding 10 lights, but not exceeding 45 lights capacity, each	4.00
Exceeding 45 lights capacity, each	8.00

This rule shall not interfere with the practice of a utility in its tests of gas service meters, except that in the event of a written application to the Commission by a consumer for a referee test the utility shall not remove or interfere with the meter without the consent previously given in writing of the consumer.

Calorimeter Equipment.

Each utility whose gas output exceeds 20 million cubic feet per year shall equip itself with a complete standard calorimeter outfit of a type approved by the Commission, and shall test the heating value of gas supplied, using methods of test in accordance with the best practice. The heating value of manufactured gas shall be determined at least three days each week, and of natural gas at least three times a year.

Heating Value.

Each utility furnishing manufactured gas shall supply gas which at any point at least one mile from the plant, and tested in the place where it is consumed, shall have a monthly average total heating value of not less than 565 B.Th.U. per cubic foot; and at no time shall the total heating value of the gas at such point be less than 530 B.Th.U. per cubic foot.

To arrive at the monthly average total heating value of a gas, the results of all tests of total heating value made on the days prescribed for testing during the calendar month shall be averaged, and the average of all such daily averages shall be taken as the monthly average.

Provided, further, that in case gas is carried by mains at 5 lbs. pressure or over per square inch, there shall be an allowance in the service of such high-pressure district of 35 B.Th.U. per cubic foot in the monthly average, and the minimum heating value shall not fall below 520 B.Th.U. per cubic foot. No utility shall lower its present standard heating value without first obtaining in writing the consent of the Commission.

Purity of Gas.

(*a*) *Hydrogen Sulphide.*—Manufactured gas distributed in this State shall not contain more than one grain of hydrogen sulphide per 100 cubic feet. Any test approved by the Commission may be used for the determination of hydrogen sulphide. This purity requirement will be considered satisfied if a strip of white filter-paper recently moistened with a solution of 100 grains of lead acetate in 100 cubic centimetres of water be exposed to the gas for 1½ minutes in an apparatus previously purged through which the gas is flowing at the rate of approximately 5 cubic feet per hour, the gas not impinging directly from a jet upon the test paper, and after this exposure the test paper be found not distinctly darker than a second paper freshly moistened with the solution and not exposed to the gas. Test papers shall be kept for one year by a safe and secure method, and shall be available to the Commission if and when desired in that period.

(*b*) *Total Sulphur.*—Manufactured gas distributed in this State shall not contain more than 30 grains of total sulphur per 100 cubic feet.

(*c*) *Tests of Gas Purity.*—Each utility supplying manufactured gas shall, for the purposes of record, daily test the gas leaving its holders for the presence of hydrogen sulphide in the manner specified. Each utility supplying manufactured gas whose sales exceeds 50 million cubic feet of gas per year shall provide and maintain such approved apparatus and facilities as are necessary for the determination of total sulphur; and each such utility shall daily determine the amount of total sulphur in the gas distributed by it.

Pressure of Gas.

(*a*) *Pressure Variation.*—The pressure of gas supplied by any utility as measured at the outlet of any consumer's meter shall not be less than 2 inches nor more than 8 inches of water pressure, except where greater pressure is specified and provided for in the contract between the utility and the consumer, and provided there be no unfair and unreasonable discrimination or preference. Within the said limits, the daily variation of pressure at the outlet of any one meter on the system shall never be greater than 100 per cent. of the minimum pressure at the outlet, provided that variations in pressure entirely beyond control of the utility shall not be considered as a violation of this rule.

(*b*) *Pressure Surveys.*—Each gas utility shall provide itself with one or more portable graphic recording pressure-gauges, and shall make frequent measurements of the gas pressure and of the pressure variation throughout the system.

Record of Interruptions.

Each utility shall keep a record of all interruptions to service on its entire system or on any portion thereof, which record shall contain the time, cause (if known), extent, and duration of the interruption.

Extension of Mains.

(*a*) *Definitions.*—For the purpose of this a high-pressure system shall be taken to mean one in which the gas is carried at a pressure of 2 lbs. or over per square inch to the consumer's premises where a service governor is installed to obtain a reduced pressure on such premises. A low-pressure system shall mean a system in which the consumer's service is connected directly to a main carrying less than 2 lbs. per square inch water pressure.

(*b*) *Free Extensions.*—Each utility shall, upon a written request for service by a prospective consumer or a group of prospective consumers located in the same neighbourhood, make free of charge a street-main extension necessary to give service, provided that the length of the entire extension is not greater than that obtained by allowing 100 feet per consumer for a low-pressure system and 200 feet per consumer for a high-pressure system.

(*c*) *Extensions above Free Limit.*—If the main extension required in order to furnish service at any point within the corporate limits of any city or village, or for any adjacent suburb of a city or village, is greater than the free extension specified above, such an extension shall be made under the following conditions: The utility may require a deposit of the cost of the extension above the free limit, and shall, in such a case, refund an amount equal to the cost of the free main extension for each additional consumer whose service shall be taken off the entire extension within a period of ten years from the making of such an extension; but at no time shall the rebate made exceed the original deposit. If the extension is of such length, and the prospective business which may be developed by it is so meagre, as to make it doubtful whether the business from the extension would ever pay a fair return on the investment, the facts shall be reported to the Commission for investigation and determination as to the reasonableness of such extension. This rule shall not be construed as prohibiting any utility from making free extensions of lengths greater than above specified, or from providing a method of return of deposits for extensions more favourable to consumers, so long as no discrimination is practised between consumers whose service requirements are similar.

(*d*) *Contract for Service.*—Utilities will not be required to make street-main extensions as described in this rule unless those served by such extensions shall contract to use the service for at least one year.

EXPORTS OF COAL PRODUCTS, NOT DYES.

The Trade of Germany and Austria-Hungary.

The Commercial Intelligence Branch of the Board of Trade have issued a report (No. 67), in connection with competition with Germany and Austria-Hungary in neutral markets, dealing with the subject of heavy chemicals. Particulars in reference to chemicals used as artificial manures have already been issued by them [see "Journal" for Sept. 29, p. 733].

The report opens with the following statement showing for a recent year the value of the heavy chemicals named which were exported to all destinations from Germany, Austria-Hungary, and the United Kingdom.

Description.	From Germany (1912).	From Austria-Hungary (1913).	From United Kingdom (1913).
Aluminous sulphates (including alums)	£390,400	£3,945	£77,400
Arsenic and its oxides and compounds	56,440	..	13,500
Bleaching materials	245,800	11,900	168,600
Coal products, not dyes—			
Carbonate of ammonia	5,800	1,000	132,300
Aniline oil and aniline salts	628,400	130	28,900
Benzol, toluol, &c.	342,500	..	302,800
Carbolic acid (including phenol)	194,100	8,250	190,500
Coal tar	163,300	3,850	84,900
Naphthalene	44,300	7,750	37,700
Pitch	183,200	78,600	1,100,000
Anthracene, creosote, and other tar oils	360,500	..	592,400
Sulphate of copper	87,100	4,100	1,701,200
Cyanide of potassium or sodium	472,000	..	562,200
Soda compounds—			
Soda ash	319,900	12,100	563,300
Bicarbonate of soda	18,400	175	123,600
Caustic soda	125,700	80	723,700
Chromate and bichromate of soda	77,600	100	59,900
Soda, raw and crystallized	6,000	800	45,300
Sulphate of soda	158,800	3,785	114,000
Sulphuric acid	186,400	28,000	62,700
Total	£4,066,600	£164,565	£6,684,900

Figures are next given which the report points out show that the imports of these chemicals into the United Kingdom from Germany are relatively insignificant when they are compared with the output of the same articles in this country; and "in these particular lines British manufacturers have no need to fear German competition in the home market."

In the matter of competition in specific chemicals in colonial and neutral markets, the report gives full figures relating to each chemical and each separate country; and to these are attached the following summarized statements of the position and prospects with reference to the coal products.

Carbonate of Ammonia.—The United Kingdom has practically the whole of the export trade in carbonate of ammonia to the principal colonial and neutral markets, though there is a certain amount of German competition in Italy and Switzerland, and in the South American markets.

Aniline Oil and Toluidine.—There would appear to be openings for the British-made article in the United States, Switzerland, Italy, Russia, Spain, Belgium, the Netherlands, Turkey, and Japan.

Benzol and Toluol.—The bulk of the benzol and toluol exported from both Germany and the United Kingdom is sent to France. In present circumstances, there would appear to be exceptional opportunities for extending the sale of British-made benzol and toluol in that market. Openings also exist in the Belgian, Dutch, Italian, Swiss, Russian, Argentine, and United States markets, though the possibilities in these markets are much smaller.

Carbolic Acid.—The exports of carbolic acid from Germany to the principal colonial and neutral markets are slightly larger in the aggregate than those of the United Kingdom. The distribution, however, varies considerably. Thus, the United Kingdom supplies the bulk of the carbolic acid required in British India, Sweden, and the Netherlands. Germany, on the other hand, has hitherto taken the lead in supplying the French, Swiss, Russian, and Japanese markets. In the United States market, the United Kingdom and Germany up to now

have shared the market about equally. Valuable openings for the sale of carbolic acid at the expense of Germany would appear to exist in France, Italy, Switzerland, Russia, Japan, and the United States.

Coal Tar.—The United Kingdom already holds the bulk of the trade with British India, British South and West Africa, and Australia; while Germany holds a long lead in the Belgian, French, and Russian markets, which at the moment offer considerable openings for the supply of British-made coal tar.

Naphthalene.—This is a small trade. The United Kingdom does the bulk of the business with British South Africa, the Netherlands, and Italy. Germany takes the lead in Sweden, Denmark, Belgium, Switzerland, Russia, and Turkey; while the United Kingdom and Germany roughly divide the trade with France, China, and the United States fairly equally between them. There should be a number of small openings in the markets mentioned.

Pitch (Mineral Pitch).—In some of the smaller markets—*e.g.*, the Netherlands, Switzerland, and Turkey—the larger portion of the pitch imported comes from Germany; but in the larger markets, though Germany does a fair trade, the United Kingdom holds a far stronger position than Germany. This is particularly the case in Belgium, France, Russia, and Egypt.

Tar Oil, Creosote, &c.—Over 90 per cent. of the United Kingdom exports of tar oil, creosote, &c., are sent to the United States, where there is not very much competition from German tar oil. On the other hand, Germany sent nearly one-half her total exports of tar oil to the Netherlands, Belgium, and France, to which markets British exports of tar oil are relatively small. Both the United Kingdom and Germany do a fair trade with Canada, Norway and Sweden, Italy, Russia, and Brazil; but in Switzerland and Roumania the British product is unrepresented—the whole of the trade going to Germany.

Exports of Benzol, Toluol, &c.

Country to which Exported.	From United Kingdom (1913).	From Germany (1912).	From United Kingdom (1913).	From Germany (1912).	
	Benzol and Toluol.	Benzol, Toluol, Cumol, and Other Light Coal Tar Oils, &c.	Carbolic Acid.	Phenol (Carbolic Acid, Phenyl Alcohol), Crude or Refined.	Creosol (Methyl Phenol, Commercially known as 100 per Cent. Crude Carbolic Acid).
British India	..	£50	£1,300	£350	..
Sweden	£300	1,100	7,000	900	£350
Denmark	10	2,100	600	550	100
Belgium	300	2,300	2,400	1,500	400
Netherlands	1,300	5,900	57,100	7,700	450
France	284,800	291,900	16,400	33,700	1,200
Spain	..	100	..	1,300	..
Italy	100	5,300	3,700	5,300	650
Switzerland	3,000	7,000	300	10,900	2,000
Russia	5,300	11,500	2,200	14,500	550
Roumania	..	50	400	1,200	..
Greece	..	..	100	150	1,400
Turkey	..	..	220	600	150
Japan	..	50	5,800	32,400	1,700
Argentina	..	3,800	100	650	..
United States	1,600	2,600	60,300	53,900	4,100
Total to above markets	£296,710	£333,750	£157,920	£165,600	£13,050
Total to all markets	£302,800	£342,500	£190,500	£178,900	£15,200

Exports of Coal Tar and Naphthalene.

Country to which Exported.	From United Kingdom (1913).	From Germany (1912).	From United Kingdom (1913).	From Germany (1912).
	Coal Tar, Crude, Refined, and Varnish.	Coal Tar.	Naphthalene.	Naphthalene.
British India	£22,900	..	£400	£450
,, South Africa	13,400	£600	1,000	150
,, West Africa	1,500	700	200	..
Australia	13,610	2,000	900	650
Norway	2,900	850	10	150
Sweden	2,900	650	..	950
Denmark	900	1,700	..	300
Belgium	1,500	32,800	600	2,700
Netherlands	800	2,400	9,700	1,400
France	220	18,300	2,100	2,000
Spain	10	100	..	50
Italy	110	250	1,900	750
Switzerland	..	1,700	..	3,500
Russia	6,400	55,600	4,500	11,200
Turkey	..	600	800	1,700
China	1,600	50	1,000	1,000
Japan	..	50	200	500
Argentina	400	1,400	100	350
Brazil	440	150	10	350
Chile	200	100	..	200
United States	10	200	9,000	10,400
Total to above markets	£69,800	£120,200	£32,420	£38,750
Total to all markets	£84,900	£163,300	£37,700	£44,300

Exports of Pitch, Tar Oils, &c.

Country to which Exported.	From United Kingdom (1913).	From Germany (1912).	From United Kingdom (1913).	From Germany. (1912).
	Pitch.	Pitch.	Tar Oil, Creosote, &c.	Anthracene Oil, Carbolic Oil, Creosote Oil, and other Heavy Coal Tar Oils, Asphalt, Naphtha.
British India	£5,300	..	£600	£400
Canada	1,600	..	8,200	550
Norway	1,200	£100	2,100	2,000
Sweden	8,900	450	7,000	4,500
Denmark	300	100	1,100	3,600
Belgium	297,100	40,300	700	19,100
Netherlands	7,700	14,800	8,500	156,200
France	472,000	103,400	6,900	46,000
Italy	119,200	100	2,900	2,600
Switzerland	25	4,000	..	11,500
Russia	22,300	5,200	6,100	7,100
Roumania	100	400	..	20,600
Greece	200	..	30	1,100
Turkey	200	1,500	2,000	300
Egypt	18,800	1,500	800	50
Dutch East Indies	40	100	10	1,110
Brazil	10	100	600	2,400
Mexico	..	..	..	1,200
United States	1,400	100	491,000	66,700
Total to above markets	£956,375	£172,150	£538,540	£347,000
Total to all markets	£1,100,000	£183,200	£592,400	£360,500

Exports of Carbonate of Ammonia, Aniline Oil, &c.

Country to which Exported.	From United Kingdom (1913).	From Germany (1912).	From United Kingdom (1913).	From Germany (1912).	
	Carbonate of Ammonia.	Carbonate of Ammonia.	Aniline Oil and Toluidine.	Aniline Oil and Aniline Salts.	Anthrachinone nitro-benzol, Toluidine Resorcin, and other Coal-Tar Products.
British India	£4,600	..	£100	£5,100	£150
Canada	1,500	..	800	850	100
Australia	2,800	..	..	..	1,200
Norway	4,200	..	..	..	1,100
Sweden	5,600	..	..	450	3,200
Belgium	3,700	..	500	8,100	8,200
Netherlands	7,900	£50	3,800	7,700	6,200
France	3,900	50	3,200	1,800	35,700
Portugal	800	..	200	650	250
Spain	3,100	50	2,200	15,100	700
Italy	4,200	750	900	22,700	38,000
Switzerland	700	250	1,300	46,500	57,200
Russia	28,100	300	300	43,000	44,800
Greece	100	..	200	500	600
Servia	..	..	..	..	4,000
Turkey	500	..	..	1,100	7,900
Egypt	500	..	..	2,900	..
Japan	7,200	..	500	9,400	600
Argentina	2,800	400	..	100	200
Brazil	4,100	1,500	..	350	450
Chile	200	100	..	100	50
Uruguay	300	200	..	..	..
Mexico	200	..	300	5,500	450
United States	3,400	50	13,400	96,800	37,900
Total to above markets	£90,400	£3,700	£27,700	£268,700	£248,950
Total to all markets	£132,300	£5,800	£28,900	£327,400	£301,000

The aggregate value of the German and Austrian trade in the chemicals dealt with in the report which might under present circumstances be diverted to British manufacturers is summed up as follows:

In the United Kingdom Market.

German trade (1912)	£255,100
Austrian trade (1913)	1,120

In Colonial and Neutral Markets.

German trade (1912)	3,352,550
Austrian trade (1913)	73,855
Total	£3,682,625

Statistics relating to Austrian exports are then quoted; but these are insignificant as compared with the business done by Germany and the United Kingdom. The report concludes with particulars as to the demand for "heavy chemicals" in certain markets abroad.

Cheadle Gas Company.—At the recent annual general meeting of this Company, the accounts presented showed that the revenue for the past financial year was £2002, and the expenditure £1609; leaving a profit of £393. A dividend of 7 per cent. was declared.

ZÜRICH GAS UNDERTAKING.

Report and Accounts for the Year 1913.

We have received from the Zürich gas undertaking a copy of the report and accounts of the Zürich Corporation Gas-Works for the year 1913. The following is a summary of its contents.

The report opens with a reference to the loss which the undertaking has sustained through the death, on Dec. 16, of Herr Albert Weiss, who had been Manager of the gas-works since the year 1896.

The constructional work on the Schlieren works included the construction of a new main sewer about 1510 feet in length and of oval cross section. A centrifugal pump, having a capacity of 26,430 gallons per minute, has been installed for pumping the water from this sewer to the high-water level of the River Limmat. This work was not completed until the beginning of the present year. The railway line between the works and the Schlieren station has been duplicated. Two Reutter condensers, each of 3660 square feet water-cooling surface, have been installed in the second apparatus house. A fourth gas-meter, of 2,120,000 cubic feet per 24 hours capacity, has also been installed. A main of 14 inches diameter with four branches has been laid from the works to the ground lying to the north of the second purifying-house, in order that four balloons may be filled at the same time on this ground. The ground in question had been filled up and levelled by the deposition of refuse from the gas-works. The increase in the consumption of water on the works rendered it necessary to replace one of the existing piston pumps by a centrifugal pump of 22,040 gallons capacity per hour. A fresh boring for water to a depth of 108 feet gave a yield per hour of 57,304 gallons with a lowering of the water level of only 27½ inches. The supply thus obtained will suffice for all the requirements of the gas-works as far as they can be foreseen. Bacteriological tests of the water are being made in order to ascertain whether it can be used for drinking purposes. Considerable extensions were made in the distributing mains in the course of the year.

The total gas production was 37,762,600 cubic metres (1,333,586,220 cubic feet), which is an increase of 5 per cent. on the production in 1912. The average make per ton of coal carbonized was 12 415 cubic feet. The total consumption of coal on the works during the year was 108,764 metric tons (107,024 tons). The make of gas per ton of coal varied in the different classes of settings on the works; being 11,124 cubic feet for the inclined retorts, 12,925 cubic feet for the settings of ten vertical retorts, and 12,731 cubic feet for the settings of eighteen vertical retorts. Only German coal was carbonized during the year. The quality of some of the consignments left much to be desired; and the good average make of gas is to be ascribed to the introduction during the year of the settings of eighteen vertical retorts. The ordinary gas coal cost about the same as in 1912; but since the percentage of cannel used in 1913 was 0·36, as compared with 0·04 in 1912, the average cost of the material carbonized was rather higher in 1913.

The increase in the private gas consumption as compared with 1912 was 4·79 per cent. The private gas consumption was 86·33 per cent. of the gas made, and the gas unaccounted for was 3·78 per cent. The balance was consumed in public lighting and on the works, &c. The coke consumed as fuel under the retorts amounted to 14 per cent. by weight of the coal carbonized in the inclined retorts, to 15 per cent. in the vertical settings of ten retorts, and to 14 per cent. in the vertical settings of eighteen retorts. Mixed coke as discharged from the retorts was used as fuel for the retort-settings, except in the case of the settings of ten vertical retorts, for which screened large coke was used. The average yield of coke was 70·89 per cent. by weight of the coal carbonized, of tar 6·03 per cent., real ammonia (mostly sold in the form of concentrated liquor) 0·2357 per cent., and Prussian blue in the cyanogen sludge 0·054 per cent. These figures are slightly lower than in 1912, except in the case of ammonia, of which the yield has slightly increased. The market for coke and tar was depressed during the year, but satisfactory prices were obtained for concentrated ammoniacal liquor, cyanogen sludge, and retort scurf. The consumption of anthracene oil in the naphthalene washers averaged 2·42 oz. per 1000 cubic feet. The concentrated ammoniacal liquor as sold contained 22 68 per cent. by weight of ammonia. The net calorific value of the gas was ascertained continuously by a Junkers recording calorimeter, the results of which were checked by daily tests on an ordinary calorimeter. The average net calorific power for the year was 520 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated. The specific gravity of the gas averaged ·422. The gas as distributed contained on the average 0·07 grain of ammonia, less than 4 grains of cyanogen, and 11·8 grains of sulphur per 100 cubic feet.

The large coal-testing plant on the works was used for 57 tests of different coals, of which six were of English origin. In the physical laboratory the appliances tested included some 1000 and 1500 hefners inverted gas-burners, both of which showed a duty of 35·7 candles per cubic foot. The actual hemispherical candle power of these lamps was 869 and 1300 candles respectively. A number of new upright burners and of mantles were tested, as well as distance-lighting appliances. A cerium-iron igniting device proved quite practicable.

The number of public lamps was 7251, containing 9960 burners, both figures being a slight increase on those of 1912. The consumption of mantles averaged 5·4, and of chimneys 2·2 per burner per annum.

The accounts show a total net profit on the working for the twelve months ending Nov. 30, of 1,698,995·72 frs. (about £67,960), which is a slight increase on the net profit for the preceding twelve months.

The investigation of gas-cookers was continued—a standard method of investigation having been agreed upon between the Gas Associations of Germany, Austria-Hungary, and Switzerland. This method is based on the assumption that one of the most important points of a gas-cooker should be a relatively low consumption of gas in providing hot water and in keeping things continuously on the boil. Comparisons were made with electric-cookers, which were found to have 1·6 times the efficiency of the ordinary gas-cooker, while electric water-heaters had about the same efficiency as gas water-heaters constructed on the calorimeter principle. The bad efficiency of ordinary gas-cookers in bringing things to the boil is more than equalized by the greater facility of control in continuous boiling, as well as by the smaller initial cost of the apparatus and of the heat energy—gas as compared with electricity.

SOUTHPORT'S GAS AND ELECTRICITY UNDERTAKINGS.

Appreciation by an Elective Auditor.

The Senior Elective Auditor for Southport (Mr. J. Mawson) has issued his report to the ratepayers, in the course of which he makes the following remarks on the gas and electricity undertakings of the Corporation and their respective Engineers and Managers.

In the gas estate the Corporation possess their richest revenue-earning account, the credit of which, after all charges, including local rates, &c., charged up to the hilt, amounts to £27,644 17s. 3d. This, after payments on account of sinking fund and interest on capital, allows for the amelioration of rates by some £14,000 per annum. These facts speak for themselves; and when it is remembered that out of a capital of some £309,000 no less than an amount of about £129,000 has been repaid, and that in process of time, by the elimination of capital, the whole of the net profits can be earmarked in relief of rates, must be a pleasing reflection for the ratepayers.

The Electricity Committee's revenue, after payment of local rates and taxes and other charges, shows a gross profit of £10,149 2s. 11d., which, after payment of sinking fund and interest on capital, leaves a balance against the estate of £1850 7s. 6d., to which must be added the balance of £5919 14s. 10½d.; and £1000 in aid of rates makes a total debit balance of £8770 2s. 4½d. In this connection, I must offer the opinion that no amount should have been appropriated in aid of rates. Still, when we come to consider that something like £97,000 has been repaid out of a capital of £206,370, and that by effluxion of time the total capital will be refunded, the appropriation account will be easily overtaken, and, like the gas estate, the electricity estate will, no doubt, increase in its percentage of profit, and will become in the future a most valuable rate reducer.

I have dealt with the gas and electricity estates and their probabilities in the future. The care exercised by these Committees needs no words of appreciation of their control; and, from personal contact with Mr. John Bond, the Manager and Engineer of the gas-works, and Mr. Black, the Manager and Engineer of the electricity works, I am positively convinced you have in these two gentlemen some of he best professional talent in England. This is saying a lot; but, as one who has had a professional training and practice as an analytical chemist and metallurgist, I think I know what I am talking about. If we had a manufacturing element in our town, the profits of these two estates would increase by leaps and bounds.

DARLINGTON GAS UNDERTAKING.

Annual Accounts.

The accounts of the Gas Department of the Darlington Corporation for the year ended the 31st of March last have been issued, and we have received a copy from the Engineer and Manager (Mr. Frank P. Tarratt). They show that the total amount expended in connection with the gas-works up to date was £209,022, of which £22,442 was laid out in the twelve months reported upon; £14,829 being for a retort-bench and its equipment. The total expenditure included £7075 of the profits realized by the undertaking. The revenue account shows that the sale of gas produced £39,791; residuals, £17,768; meter and stove rents, £1910; fittings department, £196; and the total receipts were £59,984. The principal items of expenditure were: Coal and other material, labour, &c., £25,488; purification, £433; wages of stokers, £4517; repairs to works and plant, £3840; distribution, £7968; rent, rates, and taxes, £2428; and management, £2798 (including £1640 for salaries)—the total outlay being £48,065. The gross profit was £11,919. Added to £8073 brought forward, there was produced a total of £19,992, which was disposed of as follows: Transferred to the liquidation of loans account, £4686; interest on loans, £2190; district fund account in aid of rates, £7000—leaving a net profit balance of £6116.

The working statement shows that the net cost of gas (£27,872) was equal to 14s. 4·651d. per ton of coal carbonized and 1s. 5·817d. per 1000 cubic feet of gas sold; the gross profit (£11,919) being equal to 6s. 1·829d. and 7·616d. respectively, and 5·78 per cent. upon the total capital employed. The quantity of coal carbonized was 38,745 tons; of gas made, 408,089,000 cubic feet; of gas sold, 375,523,785 cubic feet, or 92·02 per cent. on the make. There were 17,874 tons of coke and breeze saleable, or 9 23 cwt. per ton of coal carbonized. The tar made was 371,187 gallons, or 9·55 gallons per ton; the ammoniacal liquor produced was 1,150,000 gallons, or 29·59 gallons per ton. The average receipts per ton of coal from the three sources named were: Coke and breeze, 13s. 7d.; tar, 31s. 4d.; liquor, 10s. 5d. The capital is equal to £5 7s. 1d. per ton of coal carbonized, 10s. 2d. per 1000 cubic feet of gas made, and 11s. 1d. per 1000 feet sold. The amount of the reserve fund and undivided profits is £8111 4s. 10d., or 9·98 per cent. on the paid-up capital. The number of consumers at the close of the financial year was 14,722, of whom 7174 were ordinary and 7548 of the prepayment class. The proportion of gas sold for private consumption was 94·56 per cent.

High-Pressure Meters in the City of London.—Intimation was made last week in the advertisement pages of certain daily papers of the fact that Part III. of the City of London (Various Powers) Act, 1914, which deals with the testing of high-pressure gas-meters, will come into force on April 1 next year. The clauses affecting the matter (which were also adopted identically in the London County Council Bill) were set out in the advertisement. They were given in full in the "JOURNAL" for July 7 last [p. 39].

GLOVER-WEST VERTICALS AT SOUTHPORT.

Excellent Results Secured.

On the minutes of the Gas Committee coming up for confirmation at the last meeting of the Southport Town Council, Mr. Hampson called attention to the following: "The report of the Gas Engineer on the tests on the working of the vertical retorts was submitted to the Committee, and considered by them to be satisfactory. Resolved, that the Engineer be authorized to sign a final certificate of completion of the vertical retorts."

Mr. HAMPSON moved that this be referred back until the Gas Engineer's report was presented to the Council for their consideration. They were there going to complete the purchase of a plant costing £15,705, according to a contract which was placed in February, 1912, and which was to be completed in March, 1913. In default of due completion, there was to be a fine of £5 per day. Not only so, but they paid nine-tenths of the purchase money before the installation passed the test required by the guarantee of the makers, which was that it should carbonize 100 to 110 tons of coal per diem. In May, with the coal they were using, they did not carbonize much more than 70 tons per day. They were asked to complete the payment, and told that the installation had now carried out the test. It would be noticed that the coal used was a special kind; the test just exceeded what the contractors promised. This was after twelve months operating, and testing, and making right. The Corporation ought to have done this before they took the installation over and paid nine-tenths of the money twelve months ago. The money they would have saved while the contractors were making the plant right would have brought in a very fair sum in interest.

Mr. SNOW seconded, and Mr. ROSS supported, the amendment.

Mr. HOULDSWORTH said the questions raised had been thoroughly investigated by the Gas Committee. The vertical retorts had carbonized up to 80 tons of slack per day. The contractors' terms were not to carbonize slack, but coal. The retorts were not erected to carbonize nuts; and yet out of the nuts, which were costing the Corporation a matter of 2s. 4d. per ton less than other coal, they could get what the contractors had guaranteed—100 tons per day. Not only had the installation come up to the contractors' standard, but it exceeded it, and this at a considerable saving to the Gas Department. These things in themselves were sufficient to convince the Corporation and the ratepayers that the gas undertaking had a competent Engineer in Mr. Bond.

Mr. RICHARDSON said he took exception to the statements of Mr. Hampson. About three years ago the Gas Committee had to increase their plant, and brought the whole matter before the Council. The Committee saw three systems of vertical retorts; and they selected the best, without a doubt, and got the best. At Southport, he was convinced they now had the best retorts in the country.

Mr. HAMPSON: I do not deny that.

Mr. RICHARDSON (continuing) said that the makers of the retorts guaranteed to carbonize so much coal per 24 hours, and give so much gas per day; and the retorts had done all that was guaranteed.

Mr. BALL remarked that some members seemed to think the Committee had been bragging or boasting. If they looked at the minutes in regard to the test, they merely found "Satisfactory;" but there was another adjective which he thought might well have been used. The Committee had restrained themselves wonderfully. He was surprised at the Engineer's modesty.

Alderman GRIFFITHS said the issue was a false one. They had, as a Council, approved of the erection of the retorts which he had advocated for years. It was a most economical arrangement. On the piece of land where the verticals were erected, they could not have put up horizontals to do one-fifth of the work. The verticals had answered the purpose for which they were erected; and they were erected for the benefit of the ratepayers of Southport. They wanted to know whether the retorts were doing their work or not. To talk about slack and coal was not an answer. The question which had been raised was what coal meant in the contract. Coal in the contract meant gas coal such as was generally used for gas-making purposes. It was time the money was paid; and he would not like anything to be done there that night which might seem to be a slight upon the Gas Engineer. There was not a better engineer in the country.

Alderman TROUNSON (the Chairman of the Gas Committee), replying, said the criticism in regard to the coal was nothing more than a quibble. Nobody present knew better than Mr. Hampson about the coal. The attack had been grossly unfair. It had not been made in ignorance, as Mr. Hampson knew the facts perfectly well. Slack in vertical retorts had never been experimented with before, so far as he knew, though they had been erected in America, Japan, Switzerland, and other countries. Mr. Ball had given the true reason why the detailed report had not been presented. It was so satisfactory that, had they put it on the minutes, some of the members would have said they were "flaunting in the face" of their critics, of whom Mr. Hampson was one of the keenest. So far as the contractors were concerned, the report would be of the utmost value to them, because it had been a revelation, and they would be benefited by the brains of their Engineer. The Committee were always experimenting with coal. This was a special lot offered to them at a special price, and as it was of somewhat inferior quality to what they had been buying, Mr. Bond suggested that they should experiment with a small lot first. The delay in the erection of the retorts had not been due to the contractors, but to difficulty with the foundations and to labour troubles. The Committee had nothing to hide. The vertical retorts were an absolute success, and would mean a saving for the Council of a very great deal of money. He only wanted them to bear in mind one fact, but it was a very important one. The terms of the contract had not only been fulfilled,

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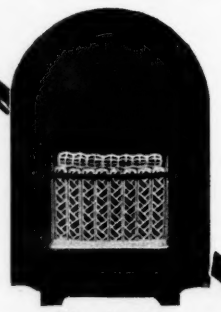

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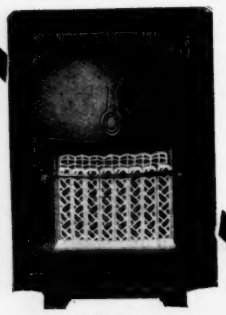

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but more than fulfilled. In the contract, the test was for the carbonizing of ordinary coal; and the installation had satisfied the test with something very much inferior to the ordinary coal which the contractors could have demanded. The test was made on pea nuts—the quality between slack and ordinary coal. Pea nuts cost 13s. 10d. per ton, while the cost of ordinary coal was 15s. to 16s. a ton.

The amendment was lost; the voting being: 14 for the amendment, and 26 for the Committee's minutes which authorized the Gas Engineer to sign the final certificate of completion of the retorts.

BRIDGWATER GAS COMPANY.

Satisfactory Working of the Vertical Retorts.

In the "JOURNAL" for Oct. 7, 1913 (p. 44), we described and illustrated the installation of Glover-West vertical retorts which had been inaugurated at the Bridgwater Gas-Works. It was stated in the report of the Directors which was presented at the recent annual meeting—the eightieth in the Company's existence—that during its nine months' working the new retort-house had given every satisfaction and had produced greatly improved results. The Chairman (Mr. R. Y. Foley, J.P.), in moving the adoption of the report, said that the new works had proved of considerable value to the undertaking, as there had been a saving in labour and increased yields from the coal. The accounts showed that the gain to the Company through the more economical working of the new plant had been as nearly as possible counterbalanced by the increased cost of coals, coupled with the lower market prices obtainable for residual products.

The report set forth that the balance of net profit for the year was £3367, which with the addition of the amount brought forward was raised to £4763. Interim dividends and debenture interest had been paid, and there was a balance of £2679 to be dealt with. The Directors recommended the payment of final dividends for the year of 5 per cent. on the "A" stock and 2½ per cent. each on the "B" and "C" stocks, less income-tax, making 10 and 5 per cent. for the year, and leaving a balance of £904 to be carried forward. The report was adopted.

The Chairman proposed the re-election of Mr. J. Hughes Cornish as Secretary and Manager, and expressed the appreciation of the Directors of the work done by him and his staff. He said it was largely due to their intelligent understanding of the new plant that had brought it to a successful working issue. Since the close of the financial year the war had come upon them, and with it the response of many of the employees to their country's call. This, of course, threw extra work on those left behind. Mr. Cornish had called in the aid of his son to fill temporarily one place; so that now the Company had three generations actively engaged in their service. The proposition was carried unanimously, and Mr. Cornish briefly responded; thanking the Chairman and Directors for their renewed expression of confidence in himself and the staff.

DARWEN MUNICH CHAMBERS AND WIDNES RESULTS.

A few weeks ago, there appeared in the columns of an East Lancashire newspaper a repetition of the statement that Darwen, with its new Munich chamber plant, would hope to compare favourably with the results obtained at Widnes. This has drawn from Mr. Isaac Carr, the Engineer and Manager of the Widnes Corporation gas undertaking, the following reply: In a recent issue it is stated that "at the Darwen Gas-Works they are putting in Munich chambers, and great things are expected from them." One optimist some time ago declared that Darwen may come to occupy the position Widnes has had so long as a district of cheap gas. This is not the first time within recent years that I have read of the wonderful things they claim to do at the Darwen Gas-Works, as compared with results obtained at Widnes; and I fear that I should not have taken the trouble to comment on this outburst, had it not been for the spirit of the times. As things are, however, I take this opportunity of saying to the Darwen optimist that he would do well to withhold his comparison with Widnes until the results of their new plant are available. Personally, I have in the past given some consideration to the plant adopted at Darwen; and on the strength of this consideration I venture to express the opinion that the results from their German process (when they do get them) will be found to be inferior to the results now being obtained from the new all-British process at Widnes! Further, the suggestion of Darwen comparing with Widnes in the matter of cheap gas, with the Darwen charges about 150 per cent. more than Widnes, and the Darwen costs of manufacture more than double those of Widnes, even when compared on the old process of working, reminds one somewhat of the Kaiser, in his vain boasting of what he has said he will do and the distance he has yet to travel before he accomplishes it.

THE SUGGESTED SUSPENSION OF SINKING FUNDS.

The proposal made by Mr. Frederick A. Price, Superintendent of the Manchester Gas Department, in last week's "JOURNAL" (see p. 85), that Government action should be sought to postpone the repayment, during the war, of municipal loans, does not find favour with those at the head of the Finance Department of the Manchester Corporation.

It is true that Mr. Price has communicated with the Local Government Board on the subject; but Alderman Copeland (the Chairman of the Finance Committee) stated on Friday that the Finance Committee were the authority to deal with these questions, and they had already given the matter their full consideration. The Finance Committee of the Corporation were, as a matter of fact, entirely opposed to any question of suspending the payment of municipal loans.

Inquiries show that the majority of the South-East Lancashire

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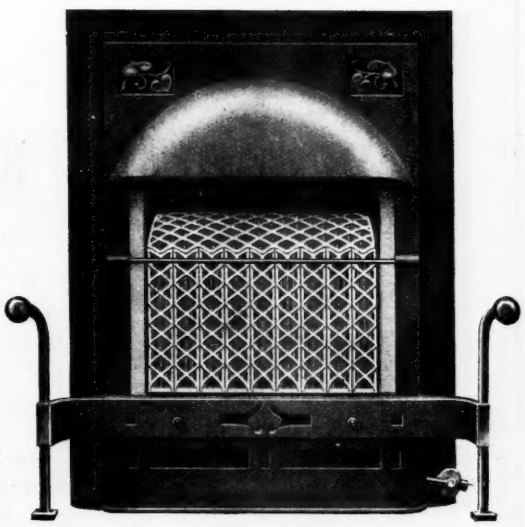

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municipalities—Nelson, Colne, Blackburn, Burnley, Bury, Stalybridge, Warrington, and Eccles, to mention only a few—approve of the suspension for one year of contributions to the sinking fund, and have already communicated with the Local Government Board. The suspension would, it is calculated, relieve the rates to the extent of from 1s. to 3s. in the pound.

A National Municipal Moratorium.

It is stated, says our Manchester correspondent, that Alderman Copeland's opinion is shared by practically all the members of the Finance Committee and their expert advisers. It is not unlikely, however, that the Trading Committees may put their view of the position before the City Council at the next meeting; and should a favourable reply also be received to the representations that are being made from other municipalities, it might be advisable to reconsider the position. It is pointed out, too, that the whole question is one that must first be reviewed by the cities, boroughs, and urban district councils through their organizations. A national municipal moratorium policy with regard to sinking funds would undoubtedly mean a tremendous relief to the rates.

FUTURE OF LONDON'S ELECTRICITY SUPPLY.

The Proposal of the County Council.

At the Meeting of the London County Council last Tuesday, the report of the Special Committee on the electricity supply of London which was submitted at the close of July last, and was outlined in the "Journal" for the 28th of that month (p. 227), was again before the members, and it was resolved, without discussion, that public notice should be given of the intention of the Council to consider at their meeting on the 10th prox a proposal to take the necessary steps for promoting in the next session of Parliament legislation dealing with the establishment of a new electricity undertaking for the County of London and adjoining districts.

At the close of their report, the Committee say: Our scheme, as now outlined, differs from previous proposals in three important respects: (1) It represents a combination of municipal and private enterprise designed to ensure full control by, and an adequate share of profits to, the public, with the flexibility and commercial enterprise of company management. The best features of both systems of working will thus, it is hoped, be secured. Moreover, under the arrangements contemplated it is hoped that the services will be secured in the working of the new undertaking of those who have wide experience of the electrical industry and of the peculiar conditions obtaining in the area dealt with. (2) Our scheme involves the co-operation of the authorities in Outer London with the London County Council; and in view of the importance of the outside area to a thoroughly satisfactory scheme of supply, we regard this as a very important point. (3) No compulsory purchase of existing undertakings will be entailed; and interference with existing undertakings will be reduced to a minimum. The keynote of the whole proposal is that it is an offer to the existing undertakings of a means of increasing the efficiency of their present undertakings, or, if they prefer it, an offer of a means of handing over their complete undertakings to a central authority, on terms to be agreed. Under the scheme put forward, no immediate or drastic "scrapping" of existing capital is contemplated; but a great increase in consumption and a reduction in the selling price will be effected at an early date. The date and extent of this reduction will depend upon the rate at which the existing undertakings realize the advantages offered to them and come into line with the central authority.

LIVERPOOL AND ITS WATER SUPPLY.

At last Tuesday's meeting of the Liverpool Water Committee (the last for the current Municipal Year),

Colonel Porter, the Chairman of the Committee, in replying to a vote of thanks for his services during the twelve months, remarked that a full constant service had been maintained throughout the year, but the resources of distribution in some of the outlying districts had been heavily strained owing to the exceptionally high demands for water during the summer months. The consumption since June had been the highest on record; the average increase for the last two months being 20,301,000 gallons per week over the consumption in the corresponding period of last year. The maximum in any one week was 264,766,000 gallons for the week ending Sept. 5—equal to an average rate per head per day of 40·70 gallons. A considerable amount of the increase was, however, due to additional use of water for trade and shipping purposes; the actual increase for the whole of the year under these two heads being 225 million gallons, while the corresponding increase for 1913 over the previous year was only 45½ million gallons. The long continuance of fine weather also led to a large increase in the use of water for public sanitary purposes. No new works of importance had been carried out in the Liverpool district; but a promised improvement of the Chorley undertaking, by the addition of a covered filtered water reservoir, had been commenced. The agreement between the Corporation and the Treasury with regard to the afforestation at Lake Vyrnwy had now been completed and was in operation. The negotiations connected with this scheme had occupied a much longer time than was expected; but the delay had been due to the fact that the agreement being the first of its kind, and being likely to form a precedent, its details required the careful consideration of the various authorities concerned. The outbreak of war had put an unusual strain upon the Water Department during the last two months. Altogether 75 officers and workmen had left for military service; and these included

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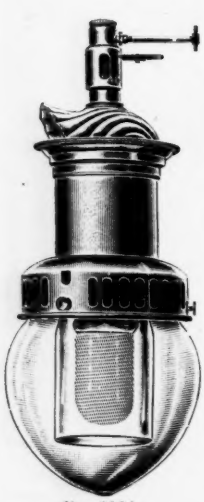

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many of the most active and useful members of the staff. Measures for the protection of the works had also made it necessary to take away a number of men from their ordinary duties. In the duty of protection, patrolling, and sentry duty, the Committee had had valuable assistance from the military and police.

Mr. WETHERED, the Deputy-Chairman (who was also thanked), in the course of his reply, expressed the indebtedness of the city to the staff and to Mr. Joseph Parry, the Consulting Engineer, who had resumed charge of the department owing to Major Davidson having joined his regiment for active service.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The Admiralty Order for the reduction of lighting in London, as also in some of the towns on the East Coast of Scotland, which has been in force for some time, has now been applied to Edinburgh. The Town Clerk (Sir Thomas Hunter) has received a letter from the Secretary for Scotland stating that the Lords of the Admiralty consider that, in the interests of the community, similar precautions in regard to public and private lighting should be taken in Edinburgh. Public intimation has now been given by advertisement, signed by Lord Provost Inches and the Town Clerk, that the Corporation are taking steps to carry out the Order, in so far as public lighting is concerned; and the attention of the citizens is specially directed to its terms in so far as it applies to private lighting. The Order indicates to the Corporation how public lighting should be dealt with. Regarding private lighting, sky signs and all powerful lights used for advertising or the illumination of shop-fronts are to be discontinued; intense inside lighting must be reduced; in tall buildings illuminated at night the windows must be shrouded; all large lighted roof areas must be covered; and all lights along a water front are to be masked. For some time, in the outskirts of the city, the public lighting has been considerably curtailed. Now, however, the Order has been more rigorously put in force; and in the main thoroughfares especially the change is marked. The public lighting has been reduced by at least one-half. When the police called upon the shopkeepers in the main thoroughfares, and brought the Order under their notice, all who were thus warned at once loyally complied with what was required of them.

At the ordinary monthly meeting of the Alloa Town Council last Monday, the annual budget was submitted by Mr. Hepburn, the Convener of the Finance Committee. The balances at the beginning of the financial year amounted to £2228, and at the close to £1254—a decrease of £974. It was proposed to make the total rates for the current year 10½d. instead of 10d. in the pound on the owner, and 3s. instead of 2s. 6d. on the occupier. At a meeting held the following evening, however, the estimates were fully considered, and it was decided to increase the rate on the owner by ½d. in the pound, and on the occupier by 3d. in the pound, as compared with the previous year. One rearrangement which enabled the Council to make this reduction was the contracting by the Gas Department for the public and private lighting of the town. This, it appears, will mean a saving to the rates—through the gas being supplied at cost price—of something like £270 a year, or a little more than 1d. in the pound. Another factor was the increase of 1d. per 1000 gallons on the charge for filtered water supplied to public works.

The proposed extension of the Perth Corporation gas undertaking to Pitcairnfield and the district gave rise to a discussion at the meeting of the Town Council on Tuesday. In the result, they decided, by a substantial majority, to proceed with the extension, in the event of suitable terms being arranged with the parties who are now responsible for the lighting of the district.

A special meeting of the Dalbeattie Town Council was held on Monday night to consider a letter from the Local Government Board asking for observations by the Council on the decreased supply of water for the burgh, a report by the Medical Officer of Health on the present position of matters, and particulars of any steps which are being taken to increase the supply. Dr. Dawson, the Medical Officer of Health, reported that at 20 gallons per head per day on the restricted service there was 22 days' supply of water, and on a 15-gallon basis 31 days' supply. A motion was proposed that borings should be made on the ground in the vicinity of the reservoir, so as to ascertain if sufficient water was there to justify the expense of leading it into the reservoir; but this was defeated by five votes to four—the amendment being to take no action, but consider the question of more storage. It was decided to intimate to the Local Government Board that, in the opinion of the Council, the worst was past, that everything had been done to conserve the supply, and that generally it was sufficient for the requirements of the burgh.

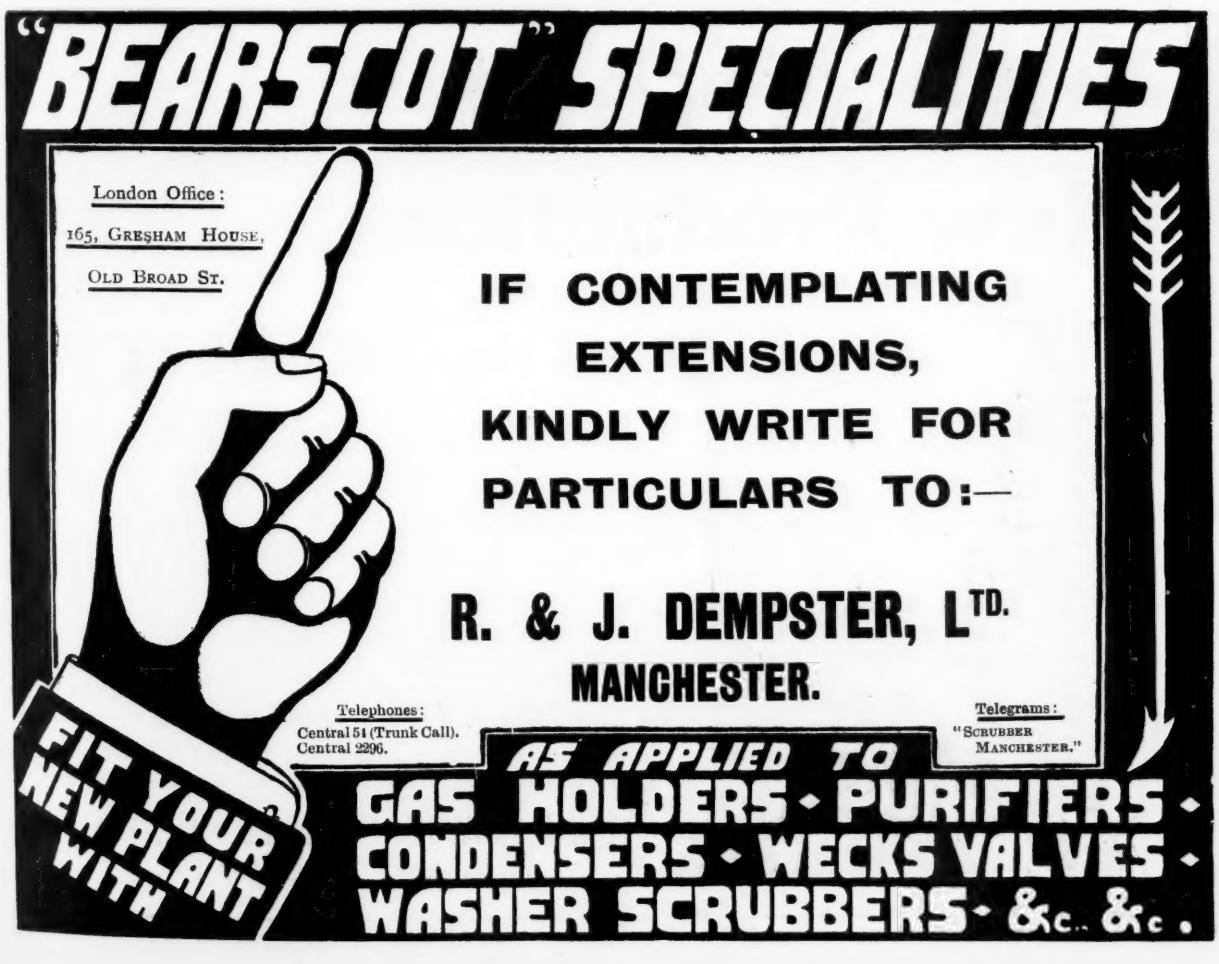
CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 19.

There is very little to report as to tar products during the past week. Some shipments of pitch and creosote in bulk are being made, which is satisfactory, as showing not only that means of communication are open in some directions, but that some Continental buyers can receive pitch cargoes. Carbolic acid is firm, and 2s. 4½d. to 2s. 6d. net per gallon is asked. Toluol is still in large demand. It is reported that 90-160 solvent naphtha has been done at 1s. net and naked at makers' works.

The position of sulphate of ammonia remains unaltered, and sellers of the 25 per cent. quality ask £10 16s. 3d. to £10 17s. 6d. per ton net



and naked at makers' works for prompt delivery, and a premium for anything forward.

Tar Products in the Provinces.

Oct. 19.

The markets for tar products on the whole remain in about the same position as last week. Ninety per cent. benzol is quiet, and there appears to be a fair amount of this article offering. There is an exceptional demand for toluol, and high prices are reported to have been paid. Solvent and heavy naphthas are both quiet. Creosote is fairly firm, and some good prices are reported to have been paid. Crude carbolic shows signs of improvement; the demand for crystals being exceptionally good.

Average values during the past week. Value of liquid products in one ton of tar, 15s. 9d. to 17s. 3d. Benzol, 90 per cent., naked, North, 9½d. to 10d.; 50-90 per cent., naked, 11½d. to 1s. Toluol, naked, North, 1s. 6d. to 1s. 7d. Crude naphtha, in bulk, North, 4½d. to 5d. Solvent naphtha, naked, North, 9d. to 9½d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3¼d. to 3½d. Heavy oils, in bulk, 4d. to 4½d. Carbolic acid, casks included, 60 per cent., East and West Coast, 2s. 4d. to 2s. 4½d. Naphthalene, £5 to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1¾d. to 2d.; "B" nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Oct.* 17.

During the past week further large inquiries for shipment to Java have come into the market, and the tone has been very strong. Prices advanced rapidly until the last day or two, when the market became somewhat quieter, and at the close values are firm at £10 17s. 6d. per ton f.o.b. Hull, £11 f.o.b. Liverpool, and £11 2s. 6d. f.o.b. Leith. In the early part of the week first-hand business was reported at £11 2s. 6d. f.o.b. good port for November-April delivery; but subsequently makers raised their limit, and this fact has stood in the way of further transactions.

Nitrate of Soda.

There is no new feature to comment upon in this article, and spot quotations are repeated at 10s. per cwt. for ordinary and 10s. 6d. for refined quality.

Sulphate of Ammonia.

From another source it is reported that the market has remained steady throughout the past week, but the jump in prices seems to have stopped further business. Outside London, makes to-day are quoted at £9 12s. 6d. to £9 15s.; Hull, £10 7s. 6d. to £10 8s. 9d.; Liverpool, £10 7s. 6d. to £10 10s.; Leith, £10 12s. 6d.; Middlesbrough, £10 7s. 6d. to £10 10s.

COAL TRADE REPORT.

Northern Coal Trade.

The Northern coal trade seems quieter, though gas coal shows some enlargement in the consumption. In the steam coal trade, the demand is not so strong, and work at some of the collieries is shorter than it was. Best Northumbrians are from 13s. to 13s. 3d. per ton f.o.b.; but forward transactions seem to be few. Second-class steams are about 11s. per ton, and steam smalls seem rather less plentiful at 7s. 10d. to 9s. per ton, according to quality; but in a few cases sales are made on special terms to give fuller employment. In the gas coal trade the demand increases, but more slowly than is frequently the case at this season of the year. Best Durhams are about 12s. 4d. to 12s. 6d. per ton f.o.b.; second-class gas coals are about 11s. to 11s. 3d. per ton; and "Wear Specials" are from 12s. 3d. to 12s. 9d. per ton f.o.b. There are good deliveries on the long contracts, and a little selling of cargoes is being made; but the high freights (such as 9s. 9d. Tyne to Genoa) tell against large buying just at present. The guarantee which the shippers must give as to the ultimate destination of coal exported also has its effect on sales. In the coke market, the demand is fair. The production of gas coke is increasing, and supplies are rather heavy. Good gas coke is increasing in export, and may be quoted as about 11s. 9d. to 12s. 6d. per ton f.o.b., according to conditions of export, &c.

A Novel Form of "Pilot."

A fortnight since a paragraph appeared in the "JOURNAL" (p. 45) in regard to the Godson "pilot," in the course of which it was stated that "a point that occurs to us is that in these days inverted gas-burners are largely the fashion. Where 'pilots' are used, the Godson cup would be inverted, and we should be afraid of the incandescent asbestos packing being dislodged by vibration." The inventor now writes that he has had his pilot in use on inverted burners for some years—all that is necessary being to turn the tube up in a curve to approach the mantle (if inverted), and so keep the cup upright.

Street Repairs in Exeter.

In the "JOURNAL" for the 6th inst. (p. 45) a paragraph was inserted in reference to a statement made by one of the Exeter city councillors as to the disturbance of streets after main-laying operations. Subsequent inquiry shows that Mr. Challice specifically called attention to the way in which the telephone authorities repaired footpaths which they had cut up, but later on in the proceedings incidentally referred to the operations of other bodies interested in the subsoil of the streets—the water and electricity departments of the Corporation and the Exeter Gas Company. In this connection, however, it is only right to point out that the Gas Company have not for a considerable time done any work in the particular street referred to by Mr. Challice.

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GAS COMPANIES IN THE STOCK EXCHANGE.

Week succeeds week, and the exercise of faith, as well as patience, on the part of the man in the street is necessary to bring him to the point of belief that something is really being done and ground gained in the direction of a piercing of the Stock Exchange *impasse*. The Committee have received particulars of the loan position of the members—and a pretty considerable figure it amounts to; and the Provincial Exchanges have also furnished statements of their own positions. With definite facts in their possession, it may be hoped that within a reasonable period of time the representatives of the various interests concerned may arrive at a scheme which will be sanctioned by the Government. Pending this, the irregular and unofficial business in stocks and shares transacted in the street or elsewhere seems to be getting quieter and quieter. Last week it was about as quiet as it could well be, and in the absence of any war news of a definitely inspiriting character, buyers were conspicuous by their absence. Prices were then easier on the whole. In the Money Market, the supply on offer at easy terms was as superabundant as ever. Discount rates were rather firm.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 5 per cent.

A Fatality at Beckton.—A verdict of "Death from misadventure" was returned by a Coroner's Jury who last Tuesday inquired into the circumstances of a fatality at the Beckton Gas-Works. It appeared that deceased, whose name was William Harnett, died in the hospital from septic poisoning consequent on burns sustained while at work in the retort-house.

Coke-Oven Gas for Middlesbrough.—A supply of gas from Messrs. Samuelson's coke-oven works to the Middlesbrough Corporation was turned on for the first time last Thursday. It is stated that about a million cubic feet of gas per day will be sent into the Corporation holders, for use in the district. This ceremony is referred to in a letter which appears in our "Correspondence" columns to-day.

A Belfast Gas Poisoning Fatality.—A verdict of "Death from misadventure" was returned by a Belfast Coroner's Jury last week in the case of Susan Skillen, 30 years of age, a domestic servant, who had been found unconscious in her bedroom in her employer's residence at Balmoral Avenue; the gas-tap being fully turned on. The woman died soon after the discovery. In the opinion of Dr. Williamson, who was called in, death was due to gas poisoning. He thought it probable deceased turned the gas off and accidentally opened the tap again.

American Incandescent Mantles and Fittings for Britain.—The United States Consul in Birmingham has reported to his Government that the cutting-off of supplies of incandescent gas-mantles throughout England promises shortly to create a serious want, and that the Secretary of the Birmingham Gas Department would like to hear from American manufacturers of mantles, glass chimneys, and supports for mantles, with a view to meeting the requirements of the department. The Consul has forwarded samples of incandescent mantle-holders to Washington.

Sadler and Co.—Including £3883 brought forward, the available balance of this Company is £27,819. The interim dividend of 3 per cent. took £4775; depreciation of plant requires £6000, and £5000 is to be added to the reserve fund (making it £35,000). A sum of £6781 will be carried forward. Owing to the war and the consequent stoppage of exports to the Continent, where virtually all their products are used, the Company are under the necessity of putting most of their manufactures into stock, while at the same time having to relieve the gas and coke-oven companies of their tar and naphtha. The Directors think the question of any further dividend should be left for consideration later on.

Dorking Gas Company.—A dividend at the rate of 5 per cent. per annum on the various classes of shares was declared at the 87th half-yearly meeting of the Company. This will absorb the sum of £1250, and leave a balance of £779 to be carried forward. The Chairman (Mr. Herbert Young) said that the accounts could, on the whole, be regarded as satisfactory. A good deal of the extra cost of coal had been counterbalanced in other ways. More favourable contracts for coal are now running. Mr. Mitchell, in proposing a vote of thanks to the Directors, the Engineer and Manager, and other officials for their services, said the shareholders were grateful to them for the improvement in the Company's position.

Protection of London's Water-Works.—At the meeting of the Metropolitan Water Board last Friday, the Chairman (Mr. E. B. Barnard) made the following remarks: "It is not expedient that I should refer in detail to the steps which we have taken for the protection of our works against possible attacks by evil-disposed persons. I may say, however, that, in my opinion, these steps are highly efficient. The public may rest assured that, in the department of work which it is your privilege and mine to administer at the present time, we are determined to use our best endeavours to ensure, as far as within us lies, the maintenance of that service which, as I have said, is so vital to the interests of London and, indeed, the whole nation."

Good Gas Lighting at Newport (Mon.).—The statement that the reason why in a certain case it had been decided to change the lighting from gas to electricity was to comply with the policy of the Corporation where practicable to substitute electricity for gas, led to some discussion in the Newport (Mon.) Town Council. The Mayor (Dr. J. L. Davies) added that this policy was adopted because the Corporation provided the electricity, while a Company supplied the gas. Mr. Thomas (a member of the Labour party), who had raised the point, remarked that in some cases he found that the lighting by electricity was worse than that by gas. The streets where there was electricity were on the whole worse lit than those which had gas. It seemed to him to be a bad policy to be producing at a higher rate an inferior commodity and supplying it to the public because its production was paid for out of the rates, instead of supplying a superior commodity at less cost the production of which was not paid for out of the rates.

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Next Year's Meeting of the Institution of Gas Engineers.—The minutes of the various Committees of the Southport Town Council recommending the granting of the use of the Cambridge Hall, &c., for the members of the Institution of Gas Engineers attending the conference to be held in Southport in June, 1915 [as mentioned on p. 91 of last week's issue] came before the Council last Tuesday night, and were confirmed.

Labour Troubles at Warrington.—Some little difficulty was experienced during the early portion of the past week in maintaining an adequate supply to the Warrington gas consumers, owing to local labour troubles. The official explanation was: "On Saturday night a number of workmen failed to put in an appearance, and in consequence part of the works had to be stopped. We cannot give a full supply unless we can obtain more suitable workmen."

Boston Water Supply.—There having been frequent complaints of late as to the inadequacy of the water supply for domestic purposes, the Sanitary Committee of the Boston Town Council instructed their Medical Officer to communicate with the Local Government Board asking them to send down an Inspector to inquire into the matter. It was reported by a deputation who had been appointed to wait upon the Directors of the Water Company that the latter had promised to provide a more plentiful supply from Willoughby for drinking purposes and to improve the arrangements for delivery.

Bury and the Outlying Districts.—At the monthly meeting of the Tottington District Council last week-end, it was stated that the Bury Corporation had increased the price of gas in that area by 1d. per 1000 cubic feet, while the price to the consumers residing in the borough boundary had been reduced. It was resolved that the Clerk should write to the Bury Gas Committee protesting against the increased charge to consumers in the Tottington district while the profits from the supply of gas are sufficient to enable the Gas Committee to make a reduction in the charges to consumers within the borough.

Bourne Gas-Works Purchase.—In connection with the purchase of the Bourne Gas-Works, an endeavour has been made by the Urban District Council to obtain the sanction of the Local Government Board to an extension of the period for the repayment of the loan beyond the usual time of thirty years; but at the last meeting of the Council it was reported that the Board had declined to accede to the application—thirty years being the longest time granted by them for such purposes. It was explained by the Clerk that, under these circumstances, the charge for loan and interest would be £880 annually; and he was directed to proceed upon this basis with an application for a loan.

Extension of the Widnes Water Area.—Mr. R. G. Hetherington, M.Inst.C.E., recently conducted an inquiry, on behalf of the Local Government Board, into an application by the Town Council of Widnes for sanction to borrow £5000 for the purpose of a scheme whereby it will be possible to extend the area of their water supply to Bold, a progressive neighbouring township. Among those present was Mr. Isaac Carr, the Gas and Water Engineer, who stated that the district it was intended to supply with water would, according to expert mining opinion, prove to be the foundations of huge coal-mining towns which it was anticipated would spring up during the next hundred years. There was no opposition to the scheme.

Watford Gas Company's Co-Partnership Scheme.—At the annual meeting of co-partners of the Watford Gas Company, Mr. E. J. Slinn (the Chairman of the Company), who presided, said this was the fifth completed year of the scheme, and every year had added to its success. The co-partners now numbered 115, and the bonus and interest divided among them for the past year amounted to £533. Nearly £3000 of the Company's stock had been purchased since the initiation of the scheme, and divided among the co-partners. This alone represented a division annually of £176, by way of dividends—a nice little annual income, which would never have been realized by the co-partners without the help of the scheme.

Cardiff and the Coal Bye-Products Industry.—At the meeting of the Cardiff Technical Schools Committee last Wednesday, Mr. Charles Coles, the Superintendent of Technical Instruction, submitted a report on the subject of the German industries in this country, in the course of which he made some suggestions for the extension of British trade. Acting upon instructions from the Committee, he had been in touch with persons engaged in the electrical, chemical, and toy-making industries, and had also consulted members of the technical school staff. Undoubtedly, he said, the German chemists, prior to the war, had reached a higher state of efficiency than that of any other nation, and this was reflected in the lead the Germans had taken in many branches of the chemical industry. In the Cardiff district, however, there was one branch of work which might be pursued with much greater success than was at present the case—viz., the methods of dealing with the various bye-products of coal. This was particularly the case with ammonia and ammonia salts. The distillation of tar might also be taken up to a greater extent than was now the case; while there was no reason why the aniline dye industry, which formerly flourished in this country, should not again be carried on with success. Wider recognition of the necessity for more scientific and technical education in business was necessary.

South Barracas (Buenos Ayres) Gas and Coke Company, Limited.—A circular-letter addressed to the shareholders of this Company by the Secretary (Mr. W Upton) says: "The Directors regret that, owing to the severe financial crisis in Argentina and the enforced economies resulting therefrom, they are unable to recommend the payment of the usual interim dividend."

Discs for Pennies at Hindley.—At the last meeting of the Hindley (near Wigan) District Council, the Clerk called attention to the fact that at a house in Platt Bridge where a prepayment meter had been in use, a large quantity of metal and cardboard discs had been used in lieu of pennies. The tenant, who had been warned, offered to pay the price of the gas consumed. The offer was accepted; but the Council expressed their disapproval of the practice, and gave the Engineer instructions upon the matter.

Middleton Electricity Deficit.—At the last meeting of the Middleton Town Council, Mr. Clegg Newton asked if anything further had been heard from the Local Government Board with regard to the recent inquiry [see "JOURNAL" for Sept. 15, p. 628], and whether the Electricity Committee had taken steps to put the finances on a proper footing, as suggested by the Inspector. Mr. Wiggins (the Chairman of the Committee) replied that up to the present nothing had been done, but the matter was under consideration.

Scarcity of Water in North-West Durham.—In view of the fact that the supply of water remaining in their reservoirs is so small as to call for measures of conservation, the Weardale and Consett Water Company decided to restrict the supply to one hour per day. This step, however, resulted in only a very small decrease in the consumption, as many inhabitants took during the one hour more water than they required for the whole day's use. It has therefore been found necessary, in order to maintain a supply for drinking and cooking purposes, to turn the water on for only one hour on alternate days.

Dangers of Reduced Lighting.—At the meeting of the London County Council last Tuesday, Mr. W. C. Johnson asked the Chairman of the Public Control Committee (Mr. Urquhart Fisher) whether his attention had been called to the number of accidents to pedestrians caused by motor-cars in connection with restricted public and private lighting; and whether, in the opinion of his Committee, a special speed limit should not be imposed after dusk. He also suggested that as shopkeepers sacrificed their interests for the public welfare, "selfish motorists" should be prevented from using powerful lights. Mr. Fisher said he would institute inquiries as to whether the Council had any authority in the matter; but presumably all powers of control were vested in the Commissioner of Police.

Stratford-on-Avon Gas Supply.—At last Tuesday's meeting of the Stratford-on-Avon Town Council considerable discussion took place as to a scheme for the erection of ten vertical retorts at the gas-works in two units of four, and one unit of two, at a cost of £5625; but at the suggestion of the Mayor, the matter was adjourned for a month in order that members might get some information as to the new system. At the previous meeting of the Council it was resolved to raise the price of gas 2d. per 1000 cubic feet; but last week Mr. Tyler moved that the resolution be rescinded—pointing out that the gas-works represented the only earning department of the Corporation; and during the last 35 years £22,960 had been paid over in relief of the rates. After a long debate, the motion to rescind was carried by 12 votes to 7.

Glenboig Union Fire-Clay Company.—The annual meeting of this Company was held last week in Glasgow—Mr. James Dunnachie, the Chairman, presiding. In moving the approval of the report, the Chairman said he thought the shareholders should be satisfied with the pretty good year's business and the dividend proposed. During the year circumstances had not been of the most favourable kind. In the greater part of this period the iron and steel trades, upon which the Company depended so much, had been in a depressed condition; and in August the war broke out and reduced the sales about one-half. They had also had dear coal. All these circumstances taken into account made it the more apparent that the Directors had been doing the best they could for the shareholders. He moved the adoption of the report and the declaration of a dividend of 20 per cent. less income-tax. The report was adopted.

Gas and Electricity Supply at Stafford.—At a recent meeting of the Stafford Town Council, Alderman T. Westhead, in submitting the report of the Gas and Electricity Committee, said there was again a satisfactory increase in the output of both departments—of 4·5 per cent. in gas and 8·4 per cent. in electricity. The Gas Engineer (Mr. W. M. Valon) had informed him that, owing to the low price being obtained for residuals, he anticipated that they would get from them something like £2000 a year less than formerly. This would mean a drop for the remainder of the current year of about £1500. He hoped that in this instance the Engineer's estimate would prove incorrect. The Committee were doing all they could to carry on the works with economy, and trusted they would have something for the rates when the next budget was presented, as they had had in the past. At the same meeting it was mentioned that there were two Belgian refugees employed at the gas-works, but that they were not displacing any Stafford labour. The department were short of men owing to enlistment.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

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LADY FOR SHOW-ROOM. No. 5943.
DRAUGHTSMAN AND CHEMIST. Southport Gas Department. Applications by Oct. 26.
DRAUGHTSMAN. No. 5944.
SUPERINTENDENT OF GAS FITTINGS (SINGAPORE). Applications by Oct. 27 to Mr. C. C. Lindsay, 180, Hope Street, Glasgow.

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GRAYS AND TILBURY GAS COMPANY. London Mart. Nov. 10.
REDHILL GAS COMPANY. By Tender. Nov. 2.

TENDERS FOR

Fire-Clay Goods.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by Oct. 31.
SHEFFIELD UNITED GAS COMPANY. Tenders by Nov. 3.

At a recent meeting of the Lincoln City Council, Alderman Wallis, the Chairman of the Gas Committee, stated that they had bought all the coal they would require for next year (30,000 tons) at a reduction of 9d. per ton on the previous price.

A folder which is so well arranged as to be certain of securing more than a single glance has been issued by Burners Limited, of Ingleby Street, Birmingham. It shows, by means of separate slip-in illustrations, a judiciously selected series of the firm's pendants for inverted incandescent lighting in various patterns and finishes.

Mr. J. Aspinall Marsden, the Medical Officer of Health to the Shelf (Halifax) District Council, in a report to the Council, deals with rumours of lead poisoning in the district. He says that where short lengths of lead piping are used fears of lead poisoning are groundless. No lead has been found in any sample of water taken from these pipes, and no symptoms of lead poisoning observed in any person drinking water from them. There is no epidemic of lead poisoning in the district. In houses supplied by pipes above the average length, he has found lead in the water; and it is evident that the present water supply contains some peaty acid which is acting too freely on the pipes. Until such pipes are removed, the water should be drawn in the evening for use the next day, and, if possible, filtered.

The Cambridge Scientific Instrument Company, Limited, of Cambridge, announce that they have taken over the business connection of the Leskole Company, Limited, of Enfield, who have gone into liquidation, and that Mr. F. Wakeham, the Assistant-Manager of the Leskole Company, has joined their staff.

At the last meeting of the Slough Urban District Council, the Water Committee reported that, an application having been received for a supply of water to the military camp at Langley Park, service-pipes had been temporarily laid, and water supplied by meter at the usual rate of 1s. 6d. per 1000 gallons; but it being for military purposes in direct connection with the war, the deduction of an allowance of 50 per cent. had been agreed upon.

At a meeting of the Clacton Urban District Council some days ago, the Gas Committee reported that since their last meeting there had been a decrease of 17 per cent. in the sale of gas as compared with the corresponding period of last year. This decrease, the Committee explained, was caused by a reduced consumption owing to the war, and by the use of oil instead of gas for generating purposes at the electricity works. Many gas companies were increasing the price of gas; but the Committee had no recommendation to make with regard to the matter at present.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. John Nicholson & Sons, Ltd., Hunslet Chemical Works, Leeds. Tele.: "Nicholson, Leeds." Telephone: (Two Lines) Nos. 2420 and 2421.

PATENTS AND TRADE MARKS PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS. Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

Firth Blakeley, Sons, and Company, Limited, Church Fenton, near Leeds.

AMMONIACAL Liquor Wanted. Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

CITY AND GUILDS GAS EXAMINATIONS.

MR. CRANFIELD'S Correspondence Classes are now Starting. Tuition is Thorough, Individual, and Private. Results Continue to be Strikingly Successful. Fifteen Years' Experience with Gas Classes.

Note Change of Address from Halifax to Manor Court Avenue, Nuneaton.

CITY AND GUILDS.

COURSES for the 1915 Examinations now starting in GAS ENGINEERING AND GAS SUPPLY. New Illustrated Courses. Reduced Fees. Guaranteed Results. Over 400 Passes and 14 Medals in recent years. B.Sc., A.M.Inst.C.E., A.M.I.Mech.E., and Board of Education Examinations start in October.
Correspondence College Company, King's Lynn.

ADVERTISER, well Educated (25 years of Age), Eight Years' good all round Experience in 500 Million Works as GENERAL ASSISTANT and DRAUGHTSMAN, seeks similar Position.

Address No. 5940, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS Company Secretary and Accountant, Smart and Ambitious (age 33), with a thorough Practical Knowledge of the Routine of the Business; also a General Experience of the Management of the Works (takes Full Charge in absence of Manager), desires a Change to a Larger or Progressive Company in the same Capacity. Twelve Years with present undertaking in the Midlands making 25 Millions. First-class Credentials. Would take up Shares. Could be at liberty March 1, 1915.

Address, No. 5941, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, for about Six Months for Gas Department Show-Rooms in Scotland, YOUNG LADY with Diploma in Cookery. Good Manner and Address essential. 28s. per Week.

Apply, own handwriting, to No. 5943, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED by the Corporation of Walsall Gas Department, a YOUNG LADY Capable of TAKING CHARGE of NEW SHOW-ROOM. Must be Experienced in the Use of Gas Appliances for all purposes.

Apply, by letter, giving Age, Experience, References, and Salary required, to the undersigned, marking Envelope "Show-Room."

B. W. Smith,
Engineer and Manager.
Gas-Works, Pleck,
Walsall, October, 1914.

AMENDED ADVERTISEMENT.

COUNTY BOROUGH OF SOUTHPORT.
(Gas Department.)

THE Southport Corporation require the Services of a Competent DRAUGHTSMAN and CHEMIST, who must have a Good Practical Experience in the Manufacture of Gas.

Commencing Salary, £150 per Annum.

Applications, endorsed "Draughtsman," stating Age and Qualifications, and accompanied by *copies* of not more than Three recent Testimonials, to be addressed to the undersigned and Delivered on or before Monday, the 26th of October, 1914.

By order,
J. Ernest Jarratt,
Town Clerk.
Town Hall, Southport,
Oct. 13, 1914.

DRAUGHTSMAN—First-Class Man Wanted for Leeds District, thoroughly Experienced in Detailing Pipe Work and Bye-Product Plant.

Apply, by letter, to No. 5944, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SINGAPORE, STRAITS SETTLEMENTS.
(Municipal Gas Engineer's Department.)

THE Municipal Commissioners of the Town of Singapore require a SUPERINTENDENT OF GAS FITTINGS for their Gas Department, about 25 years of Age and Unmarried, of Sound Constitution, with all-round Knowledge of Gas Fittings and Incandescent Lighting, Competent to Supervise Men and the Repair and Testing of Wet Meters, the Installation of Gas in Houses, &c., and relative Complaints, Maintenance of Public Lamps, Watering, Reading, and Repairing Meters. Experience in Meter Shops of Gas-Works or Meter Manufactory necessary. The Engagement will be for Three Years; and the Applicant is to state the earliest date upon which he could be free to leave for Singapore. The Selected Candidate must Pass a Medical Examination. A Second-Class Passage will be provided, with half-pay during the Voyage out. The Salary will be 2400 Dollars per Annum, rising by annual increments of 300 dollars to 3000 Dollars per Annum, paid monthly in Dollars, the Currency of the Colony; the value of the Dollar being Two Shillings and Fourpence Sterling. Such Transport Allowance as may be found necessary from time to time will be paid.

Applications, stating Age and Place of Birth, and giving Details of Education, Training, and Experience generally, and referring to the above requirements *seriatim*, accompanied by *copies* only of Testimonials, and also Personal References, to be lodged with C. C. Lindsay, Esq., M.Inst.C.E., 180, Hope Street, Glasgow (who will give further Particulars if requested), not later than Tuesday, the 27th of October, 1914.

ADVERTISER is prepared to Pay a Commission to anyone Introducing a SMALL GAS-WORKS that can be PURCHASED for Cash, where there is Scope for Development.

Particulars in Confidence, or write for interview to "Principal," Scripps's Advertising Offices, 13, South Molton Street, W.

STANDARD Rotary Washers Wanted with 16-inch or above Connections; also one with about 6-inch Connections.

State Price and full Particulars to No. 5945, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WISHAW TOWN COUNCIL.
(Gas Department.)

FOR SALE—One Single-Lift Counter- balanced GASHOLDER, 55 ft. diameter by 22 ft. deep, with Six Cast-Iron Columns and Girders, Chains, Weights, &c.

Offers to be addressed to A. G. Stewart, Esq., Town Clerk, Wishaw, N.B., not later than the 28th of October, 1914, marked on outside "Offer for Gasholder."

Corporation Gas-Works,
Wishaw, Sept. 28, 1914.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gas Light Company invite TENDERS for the Supply of SILICA and FIRE-CLAY GOODS required at their Works during the next Twelve Months.

Specifications and Forms of Tender may be had upon Application to the Engineer, Mr. J. W. Morrison, M.Inst.C.E., at the Company's Offices, Commercial Street, Sheffield.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Fire-Clay Goods," must be Delivered by post to Mr. Hanbury Thomas, Managing-Director, not later than the first post on Tuesday, the 3rd day of November next.

Wm. Hamby,
Secretary.
Commercial Street, Sheffield,
Oct. 9, 1914.

THE Llandudno Urban District Council invite TENDERS for the Supply of RETORTS, FIRE-CLAY GOODS, &c., Delivered free at Llandudno.

Full Particulars may be had on Application to the Gas Manager.

Sealed Tenders, endorsed "Retorts," to be sent in to the undersigned on or before Saturday, the 31st day of October, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

Alfred Conolly,
Clerk to the Council.
Town Hall, Llandudno,
Oct. 13, 1914.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 18, Finsbury Circus, E.C.

By order of the Directors of the
BOURNEMOUTH GAS AND WATER COMPANY.

NEW ISSUE OF 1000 £10 SIX PER CENT. PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 10, at Two o'clock.

Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

By order of the Directors of the
GRAYS AND TILBURY GAS COMPANY.

NEW ISSUE OF 500 £10 "B" SHARES
AND
£2500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 10, at Two o'clock.

Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given that it is the intention of the said Company to SELL BY TENDER, £2500 OF ORDINARY "B" STOCK of and in the Redhill Gas Company. The last day for the reception of Tenders will be Monday, the 2nd of November, 1914, at 12 o'clock at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Office of the Company, Brighton Road, Redhill.

By order of the Directors,
Horace Long,
Secretary.
Redhill, Surrey,
Oct. 1, 1914.

BIRTLEY IRON COMPANY,

Established 1820,

Owners of the Birtley Iron Works and Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our Manufactures, on Application.

Works: BIRTLEY, CO. DURHAM.
Newcastle-on-Tyne Offices, MILBURN HOUSE.